The Medical Epitome Series

# MATERIA MEDICA AND THERAPEUTICS

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The Medical Epitome Series.

# MATERIA MEDICA

AND

# THERAPEUTICS.

BY

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# PREFACE.

THIS epitome is intended to place the subject before the student in an up-to-date and concise manner, avoiding discussion as much as possible.

It is not intended to be a complete text-book, but rather a supplement to the larger and more comprehensive works.

In it the drugs are arranged in alphabetical order, classification being avoided for obvious reasons.

The contents are based almost entirely on the lectures of the author, which are compiled from the current literature.

It is impossible to quote references thoroughly in a work of this scope, but it is done whenever a salient point is noted.

While all official drugs and preparations are not represented in the work, those which are have been made to conform to the Eighth Decennial Revision of the Pharmacopœia.

E. J. K.

BUFFALO, N. Y., 1906.

Id Sal.

1-5000 Gr = 0.091
1-4000 " 0.114
1-3000 " 0.152
1-2000 " 0.228
1-1000 " 456
1-500 " .913

# EDITOR'S PREFACE.

In arranging for the editorship of *The Medical Epitome Series* the publishers established a few simple conditions, namely, that the Series as a whole should embrace the entire realm of medicine; that the individual volumes should authoritatively cover their respective subjects in all essentials; and that the maximum amount of information, in letter-press and engravings, should be given for a minimum price. It was the belief of the publishers and editor alike that brief works of high character would render valuable service not only to students, but also to practitioners who might wish to refresh or supplement their knowledge to date.

To the authors the editor extends his heartiest thanks for their excellent work. They have fully justified his choice in inviting them to undertake a kind of literary task which is always difficult—namely, the combination of brevity, clearness, and comprehensiveness. They have equalled the conscientious efforts with which the editor has performed his duties from first to last. Co-operation of this kind ought to result in useful books, in brief manuals as contradistinguished from mere compends.

In order to render the volumes suitable for quizzing, and yet preserve the continuity of the text unbroken, the questions have been gathered at the end of each chapter. This new arrangement, it is hoped, will be convenient alike to students and practitioners.

V. C. P.

New York, 1906.

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# MATERIA MEDICA AND THERAPEUTICS.

## CHAPTER I.

### DEFINITIONS AND SCOPE.

MATERIA MEDICA treats of medicinal substances.

It includes their origin, physical properties, chemical composition, methods of preparation, physiological action, with synergism and antagonism, and also their toxicology.

**Pharmacology.**—In its widest meaning a discourse on drugs—a term which embraces everything. It is also used in a restricted sense when applied only to the physiological action of drugs.

**Pharmacognosy** is the science which treats of the proper selection, identification, adulterations, physical properties, and constituents of drugs.

**Pharmacy** is the science which treats of drugs and the methods of preparing the same for administration.

**Therapeutics** is the application of remedies in disease. Therapeutics may be **rational** or **empirical.**

**Rational therapeutics** consists of the application of the remedy based on what is known of its action on the economy. An instance would be the use of aconite as a circulatory sedative in the excitement of cardiac hypertrophy. **Empirical therapeutics** is the application of remedies in certain diseases because they have been used with success in similar diseases before. This is generally the case when the pathology of the disease is obscure or when the action of the drug is not known, or both.

**Remedy.**—This is any agent which may be used. It includes light, heat, cold, electricity, hygienic and dietetic measures, mechanical remedies, as venesection, aspiration, bandages, splints, massage, etc. All drugs are remedies, but the converse is not the case.

**Pharmacopœia.**—This is a publication which contains a list of drugs, their description, tests for purity, their preparations and directions for carrying out the same. These publications may be issued by authority of a government and regarded as a standard by that government. In the United States the work is compiled and published by a Revision Committee, the members of which are appointed in a convention which is composed of delegates from representative associations and societies of physicians and pharmacists. The convention assembles **decennially** at Washington, D. C. The last was held in 1900; the previous one in 1890.

The **object of a pharmacopœia** is to secure uniformity of nomenclature, preparation, strength, purity, and other important characteristics of drugs and preparations of drugs. The **United States Pharmacopœia,** while issued without any governmental jurisdiction, is nevertheless accepted by the government and also many States as their **standard for use** in their various departments. All **preparations in the Pharmacopœia** are called **official.**

**Dispensatory.**—This is a publication encyclopedic in character upon the broadest field of materia medica, which also contains the Pharmacopœia and various comments thereon.

## WEIGHTS AND MEASURES.

The systems of weights and measures in common use are the **Troy** or **Apothecaries' system** and the **Metric** or **Decimal system**

**Apothecaries' System for Solids.**—This system divides weight into pounds, ounces, drachms, scruples, and grains.

The units and their equivalents are:

| Units. | Grains. | Scruples. | Drachms. | Ounces. | Pounds. |
|---|---|---|---|---|---|
| EQUIVALENTS | 20 | ℈ 1 | | | |
| | 60 | 3 | ʒ 1 | | |
| | 480 | 24 | 8 | ℥ 1 | |
| | 5760 | 288 | 96 | 12 | lb. 1 |
| Symbols. | gr. | ℈ | ʒ | ℥ | lb. |

**Apothecaries' System for Liquids.**—Volume is divided into gallons, pints, fluidounces, fluidrachms, and minims. The units and their equivalents are:

| Units. | Minims. | Fluidrachms. | Fluid-ounces. | Pints. | Gallons. |
|---|---|---|---|---|---|
| EQUIVALENTS | 60 | ʒ 1 | | | |
| | 480 | 8 | f℥ 1 | | |
| | 7,680 | 128 | 16 | O 1 | |
| | 61,440 | 1024 | 128 | 8 | C 1 |
| Symbols. | ♏ | ʒ | f℥ | O | C |

This is what is commonly known as **Wine Measure.** Gallons, pints, and pounds are but seldom used by the physician.

**Metric or Decimal System.**—The **gram** is multiplied or divided by 10. It is the weight of 1 cubic centimetre (c.c.) of distilled water at 4° C.

This system denotes **multiplication by Greek prefixes** and **division by Latin prefixes,** as follows:

| Units. | Kilo-gram. | Hecto-gram. | Deca-gram. | **Gram.** | Deci-gram. | Centi-gram. | Milli-gram. |
|---|---|---|---|---|---|---|---|
| EQUIVALENTS | | | | | | 1 | 10 |
| | | | 1 | | 1 | 10 | 100 |
| | | | | 1 | 10 | 100 | 1,000 |
| | | | 1 | 10 | 100 | 1,000 | 10,000 |
| | | 1 | 10 | 100 | 1,000 | 10,000 | 100,000 |
| | 1 | 10 | 100 | 1000 | 10,000 | 100,000 | 1,000,000 |
| Symbols. | kgm. | hgm. | dgm. | gm. | dgm. | cgm. | mgm. |

The fractional or divisional proportions are exactly the same. A table showing them is therefore omitted in the interests of space for matters more essential.

The term **decigram** is usually dropped and the word centigram substituted—thus 0.60 is rightly 6 decigrams, but is usually called 60 centigrams, probably after a practice similar to that of calling six dimes sixty cents in the American currency system.

In speaking of **liquids** 1 c.c. is the unit and all quantities less than 1 c.c. are spoken of in the same manner as are the solids—thus 0.60 c.c. is not called 0.6 of a cubic centimetre, but 60 centigrams; 0.06 is called 6 centigrams; 1000 c.c. = 1 litre.

Many use in practice the term **gram** to designate **both liquids and solids,** and the Arabic figures precede the abbreviation which is commonly used, as gm., etc.

The **cubic centimetre** is $\frac{1}{100}$ part of the **metre,** which in turn is the $\frac{1}{10000000}$ part of a **quarter of a meridian of the earth.**

Since 1 gram is the weight of 1 cubic centimetre of distilled water at 4° C., it is obvious that, since some liquids are heavier than water, 1 c.c. of these will weigh more. There is difficulty therefore in adjusting equivalents which will meet all liquids.

## The Equivalents of Household Measures in Apothecaries' and Metric Units.

In practice it is customary with some to order a medicine to be taken in certain quantities measured by household utensils, as a teaspoonful, etc.

*Teaspoons and tablespoons vary in the quantity of fluid they hold.* Ordinarily a **teaspoon** is said to hold a fluidrachm, or 4 cubic centimetres. A **dessertspoon** is said to hold about 2 fluidrachms, or 8 cubic centimetres. A **tablespoon** is said to hold about 4 fluidrachms, or 15 cubic centimetres. A **wineglass** is said to hold about 2 fluidounces, or 60 cubic centimetres. *It is advised that medicine glasses be ordered for patients when accurate dosage is desired.* **Drops** are also frequently ordered to be taken. A drop varies in size according to the density of the liquid. A heavy liquid will deliver a larger drop than a light one. Ordinarily a drop is said to equal a minim, but there is a wide variance, for there may be from 50 to 150 drops in a fluidrachm where there are generally calculated as being but 60.

## PRESCRIPTION WRITING.

**Prescriptions** are formulas which contain a list of medicinal substances, and their respective quantities and directions for compounding and inhibiting the same.

**Simple prescriptions** contain only one ingredient. **Compound prescriptions** contain more than one medicinal element. Certain combinations of medicines which are in extensive use are embodied in the Pharmacopœia and mere mention of the title is sufficient.

When the physician prescribes medicines which are not to be had in this manner he extemporizes a formula, which is called an **extemporaneous** or **magistral formula.** There are advantages in the combination of medicines.

## The Rules of Prescription Writing.

The following valuable principles of prescription writing were formulated long ago by Dr. Paris:

I. **As to Adjuvants.**—Medicines of the same general character may be given together in order to increase their energy or to render their action more certain—thus, chloral and bromides often do better than either would alone.

II. **As to Synergists.**—Different medicines are often mixed together in order to meet different and coexisting conditions without any reference to the influence which they may reciprocally exert on each other—thus, in cough it is often advisable to quiet it; morphine or codeine are often prescribed with different expectorants, as ipecac or squill, which exert their influence on the mucous membrane in cough.

III. **As to Corrigents.**—Medicines acting differently in certain respects are combined to modify each other's powers; often new powers are developed. Opium and ipecac thoroughly mixed cause diaphoresis which is greater than either one alone can produce.

IV. **Medicines are also combined** to correct some element in the operation of the chief ingredient of the formula, called the basis, by obviating any effect, unpleasant or otherwise, it may have; thus the nausea or the griping caused by cathartics may be avoided by the use of antispasmodic agents like volatile oils, etc.

V. **As to Vehicles and Diluents.**—Medicines are, finally, exhibited together in order to cover disagreeable odor or taste.

### The Parts of a Prescription.

Prescriptions are composed of the following parts:

1. **Superscription.**—℞. Name of patient and date. ℞ is the sign employed to designate the Latin **recipe,** meaning

take thou. It is the imperative mood, present tense of **recipere**, to take.

2. **Inscription.**—This part contains: **Basis**, or principal active agent. **Adjuvant**, or auxiliary, to aid the action of the basis. There may be one or more. **Corrective** or **corrigent**, to correct or modify the action of the foregoing, as volatile oils with cathartics to avoid griping. **Vehicle** or **diluent**, to give amount desired or cover taste.

3. **Subscription**, or direction to the pharmacist.

4. **Signa**, or direction to patient.

5. **Physician's signature.**

**Quantities Expressed in a Prescription.**—In the *metric system* quantities are usually in Arabic numerals, while c.c. and gm. are placed either at the head of the column or after the numerals.

When a prescription is written in the *Apothecaries' system*, for expressing quantity, certain symbolic characters are employed. They are:

| | |
|---|---|
| ♏—Minim. | gr.—Granum, a grain. |
| gtt.—Gutta, a drop. | gr.—Grana, grains. |
| ℈—Scrupulus, a scruple. | ss.—Semis, a half. |
| ʒ—Drachma, a drachm. | Ana, or āā—of each. |
| fl ʒ—Fluidrachma, a fluidrachm. | q. s., or **quantum sufficiat**—as much as is necessary. |
| ℥—Uncia, an ounce. | |
| fl ℥—Fluiduncia, a fluidounce. | ad—to or up to. |

**Example of a Properly Written Prescription.**

August 4, 1902. } **Superscription.**

For..... { Adult / Child }

| | c.c. or gm. | | |
|---|---|---|---|
| ℞—Tincturæ aconiti ..... | 0.60 | (♏x). | **Inscription.** |
| Sodii bromidi ..... | 8. | (ʒij). | |
| Syrupi aurantii ..... | 30. | (fl ℥j). | |
| Aquæ ..... | q. s. ad 90. | (fl ℥iij) | |

Misce. **Subscription.**

Signa.—A teaspoonful (4 c.c.) every four hours. **Direction to patient.**

A. B. B., M.D. **Signature of Physician.**

### The Rules of the Use of Latin in Prescriptions.

Prescriptions are usually written partly in English and partly in Latin, but occasionally Latin alone is used.

Of the superscription the symbol ℞ alone is ordinarily used, being the imperative of the verb recipio.

The body or inscription of the prescription is composed of Latin in so far as the medicinal substances are concerned, but their quantities are to-day expressed by symbols and numerals.

The words of the inscription are nouns and adjectives, and the rules governing their declension may in general be applied here.

**Declension of Nouns.**—The nominative case of all nouns of the **First Declension** ends in **a** and they form their genitive in **æ**. There are *exceptions* to this and one is *Coca*, which is accounted as indeclinable by some, while others decline it in the usual manner. Some nouns like *Physostigma* and *Theobroma* form their genitive in *atis*.

In the **Second Declension** (nouns ending in **us, um, os,** and **on**) the genitive forms in **i**. *Exceptions* to this are found in *Rhus*, in which the vowel *u* and consonant *s* are dropped and **ois** is substituted—*Rhois*. *Limon* becomes *Limonis* and *Flos* becomes *Floris*.

In the **Third Declension** both the nominative and genitive are variable. Those ending in **is** generally remain the same in the genitive. *Exceptions* are found in *pulvis*, in which the genitive forms *pulveris; Sulphis* becomes *Sulphitis; Arsenis* becomes *Arsenitis*. Those ending in **as** (*Sulphas, Carbonas*, etc.) form their genitive in **atis** (*Sulphatis, Carbonatis*, etc.).

**Neuter nouns** of the third declension form their genitive in **is**, although their nominative ending be various. *Adeps* forms its genitive in **is**, also dropping the vowel **e**—*Adipis*. *Semen* becomes in its genitive *Seminis*.

The **Fourth Declension** contains but six words of importance. They are *Spiritus*, *Quercus*, *Cornus*, *Fructus*, *Potus*, and *Haustus*, and their genitive ending does not change.

The **Fifth Declension** has no nouns which are used in prescription writing.

*Buchu*, *Catechu*, *Kino*, and *Jaborandi* are indeclinable.

**Declension of Adjectives.**—The rule which applies to adjectives in general applies in prescription writing. They *agree in gender, number, and case with the nouns which they qualify.*

## The General Method of Allotting Doses.

It is advisable when beginning to write a prescription to consider the length of time it is intended to be taken and how often. The decision of these factors gives the total number of doses. The total number of doses multiplied by the single dose of an ingredient gives the quantity of that ingredient.

The doses mentioned throughout this work are **adult doses,** and intended to be given by the mouth unless otherwise stated.

### The Methods of Allotting Doses to Children.

For a child the dose must necessarily be smaller and there are rules for calculating the dose for them.

**Dr. Young's Rule.**—Add 12 to the age of the child; divide the age of the child by the total. Thus, the age of the child is 3; add 12, the total is 15; divide 3 by 15 = $\frac{3}{15}$, or $\frac{1}{5}$. The dose then for a child of 3 is $\frac{1}{5}$ of that of the adult dose.

**Dr. Cowling's Rule.**—Divide the age at the next birthday by 24. That is, if the age of the child is 3, the dose for that child would be $\frac{3}{24}$, or $\frac{1}{8}$ of that which would be given to an adult.

It will be observed that there is a discrepancy between the two rules as regards the dose for a child of the same age. Either may be chosen, for each rule has its adherents. It is always well to bear in mind the weight and condition of the child, for often it is necessary to give less.

**Dr. Clark's Rule.**—The suitable dose is the fraction whose numerator is the patient's weight and whose denominator is 150, which is arbitrarily fixed as the average weight of an adult. Thus a person weighing fifty pounds would receive a third and another weighing seventy-five pounds a half of the adult dose.

The **basis of a twentieth-part** is more satisfactory than any of the foregoing rules of dose-determination for children and is far more readily and accurately applied. Its author is uncertain. It assumes that a patient twenty years of age, other conditions being equal, can stand a full adult dose and that a child can take as many twentieths of the full adult dose as it is years old. For infants of less than one year of age a proportion of one twentieth-part is taken as the elements of the case indicate. Thus the proportionate dose of a five-year-old child from an adult dose of one drachm is five twentieth-drachms or a quarter-drachm (fifteen minims), etc. For application to the metric system the same rule is equally convenient, because a twentieth-part is half a tenth-part and so on.

**General Rule.**—*Opium* is very badly borne by children, and its dose should be reduced more than that of most other drugs. It is safest not to give opium or its derivatives at all to newborn children. Children bear comparatively large amounts of several important drugs better than adults do. The most commonly employed drugs of this list are *Aconite*, *Arsenic*, *Belladonna*, *Ipecac*, *Jaborandi*, *Laxatives*, *Mercury*, *Quinine*, and *Squills*.

QUESTIONS.

What is Materia Medica?
What is Pharmacognosy?
What is Pharmacy?
Name a few important reasons for the existence of so many preparations.
What is Therapeutics?
What is Empirical Therapeutics? Rational?
What is a remedy?
What is a Pharmacopœia? A Dispensatory?
What systems of weights and measures are in common use in medicine?
How is the Apothecaries' weight divided? What is the lowest weight in this system?
How is the liquid measure divided? What is the smallest amount possible in this by measurement?
In the Metric system what is the unit?
What do Greek prefixes denote? What do the Latin prefixes denote? What is the approximate equivalent of 1 grain in the Metric system? What is the approximate equivalent of 1 ounce in the Metric system? What is the approximate equivalent of 1 fluidounce in the Metric system? What is the approximate equivalent of 1 minim in the Metric system? What is the difference between a drop and a minim? What conditions influence this difference? Which is the largest, a drop of ether or a drop of chloroform?
What is a prescription? What is a simple prescription? A complex prescription? What do you understand by a Magistral formula?
What are the advantages in the combining of medicines?
What is the method for allotting doses?
How do you calculate the dose for a child?
Into how many parts is a prescription divided? What is the basis of a prescription? What is the adjuvant? The corrective?
To what part of the prescription do the last three belong?
What is meant by the signa?
What verb governs all nouns in the inscription? In what case do the names of all medicinal substances in the prescription belong?
What two substances are exceptions in their genitive endings to nouns of the first declension?
What exceptions are there in the second declension?
To what declension does Syrupus belong? Spiritus? Quercus?
What is the genitive ending of Pulvis? Sulphis? Sulphas?
What is the genitive ending of Adeps? Semen?

# CHAPTER II.

## THE PREPARATIONS, INCOMPATIBILITIES, ADMINISTRATION, AND ACTIONS OF DRUGS.

### OFFICIAL PREPARATIONS.

**Aceta (Vinegars).**—These are made by **exhausting** a drug, in other words, **dissolving out** its active principles with vinegar.

**Alkaloids.**—These are organic substances, basic in character, usually alkaline in reaction, uniting with acids to form salts without the production of water, composed of carbon, oxygen, hydrogen, and nitrogen, and are either **amines**, containing carbon, hydrogen, and nitrogen, and are oily **liquids**, or they contain carbon, oxygen, hydrogen, and nitrogen and are **solids.** The important liquid alkaloids are *Coniine*, *Lupuline*, *Lobeline*, *Muscarine*, *Nicotine*, and *Pilocarpine*. *While basic in character they are feebly so and stronger alkalies easily decompose their combinations.* As a class alkaloids are themselves almost insoluble in water, but are soluble in alcohol, chloroform, benzine, and some in ether. Their salts are mostly soluble in water, less so in alcohol, and not at all in chloroform, benzine, and ether. As a class they are incompatible with tannin, forming insoluble tannates, while stronger alkalies precipitate them from solution. They are intensely bitter. The majority are vegetable in origin; some are animal in their origin and are known as **ptomains**, which are alkaloids of putrefaction, and **leucomains**, formed in living tissues, the products of tissue change. An example of the former is **tyrotoxicon**, formed in cheese and ice-cream.

**Aquæ (Waters).**—These are solutions of volatile substances in water.

**Balsama** (**Balsams**).—Resinous substances which contain benzoic or cinnamic acids.

**Cataplasmata** (**Poultices**).—Simple or medicated with anodyne, counterirritant, or antiseptic agents.

**Cerata** (**Cerates**).—Unctuous preparations, firmer than ointments, made so by the addition of wax, resin, or spermaceti, are thus termed.

**Charta** (**Papers**).—These are strips of paper prepared by immersion in medicinal solutions, and drying or coating them with medicinal substances—an example of the former would be *Charta Potassii Nitratis* (not official), intended to be burned and the smoke inhaled; the other, *Charta Sinapis* (*Mustard Plasters* or *Leaves*).

**Collodia** (**Collodions**).—These are solutions of gun-cotton alone or containing medicinal substances in addition.

**Confectiones** (**Confections**).—Soft masses of sugar, honey, etc., containing medicinal substances.

**Decocta** (**Decoctions**).—Aqueous preparations of vegetable drugs made by boiling them in water, cooling, and diluting with water to 5 per cent. strength.

**Elixir.**—Spirituous (alcoholic) preparations containing aromatics, sugar, and small amounts of medicinal substances.

**Emplastra** (**Plasters**).—Preparations containing medicinal substances incorporated in pliable, tenacious bases, and spread on muslin, linen, or kid skin.

**Emulsa** (**Emulsions**).—Aqueous liquid preparations containing oleaginous or other insoluble substances in a state of minute subdivision and held in suspension by means of gummy substances present naturally, by acacia or by such substances as pancreatin.

**Extracta** (**Extracts**).—Solid or semisolid preparations obtained by evaporating the aqueous, alcoholic, or acetous solutions of vegetable substances.

**Fluidextracta** (**Fluidextracts**).—Concentrated tinctures of vegetable drugs, in which 1 c.c. of the finished product

represents 1 gm. of the crude drug. The dose is the same as that of the crude drug.

**Glucosides.**—Organic compounds which, when heated with acids or on the addition of ferments, split up into glucose and other substances, which may be alcohols, aldehydes, or acids, while some are phenols. As a rule, glucosides are associated with resins, volatile oils, or alkaloids.

**Glycerita** (**Glycerites**) are solutions of medicinal substances in glycerin.

**Infusa** (**Infusions**).—Liquid preparations obtained by treating vegetable substances with cold or hot water, depending on the volatility of the drug, without boiling. They are **5 per cent. in strength** unless otherwise specified.

**Linimenta** (**Liniments**) are thin, oleaginous preparations intended to be applied to the skin with friction.

**Liquores** (**Solutions**).—Liquid preparations of non-volatile substances, excepting the decoctions, infusions, and syrups.

**Massæ** (**Masses**).—Pliable masses of medicinal substances intended for division into pills.

**Mellita** (**Honeys**).—Medicines dissolved in honey.

**Misturæ** (**Mixtures**).—Aqueous preparations containing insoluble substances held in suspension by viscid substances, as egg-yolk, acacia, etc.

**Mucilagines** (**Mucilages**).—Aqueous solutions of gums.

**Neutral Principles.**—A class of active principles of plants which have neither acid nor alkaline properties. They are neither glucosides nor alkaloids, although fully as active medicinally. Aloin is an example.

**Oleata** (**Oleates**) are solutions of alkaloids or metallic salts in oleic acid.

**Oleoresinæ** (**Oleoresins**).—Those so designated by the Pharmacopœia are liquid preparations of vegetable substances which contain oleoresins, and which are extracted from the crude drug with ether or acetone. They are also called **ethereal extracts** or **artificial oleoresins** in contradistinc-

tion to **natural oleoresins**, which exude from plants or trees. Examples of the latter are *Terebinthina* or *Crude Turpentine;* another is *Copaïba.*

**Pilulæ** (**Pills**).—Small spherical or ovoid masses of medicines intended to be swallowed whole.

**Pulveres** (**Powders**).—Dry medicinal substances in a state of minute subdivision.

**Resinæ** (**Resins**).—With two exceptions the resins of the Pharmacopœia are obtained by precipitating them from an alcoholic solution prepared by percolation. The exceptions are resina or rosin, obtained by distilling off the volatile oil from *Oleoresina terebinthinæ*, and resina copaibæ, obtained in the same manner from the *Oleoresina copaibæ.* **Natural resins** are those obtained as exudations from plants or trees. *Scammony* is an example.

**Spiritus** (**Spirits**).—Alcoholic solutions of volatile substances.

**Suppositoria** (**Suppositories**).—Conical, cylindrical, or ovoid masses of various sizes containing medicinal substances incorporated with a base, cacao butter or glycerinated gelatin. Only one suppository is official, *Suppositoria glycerini*, which has stearic acid with sodic carbonate to give consistence instead of cacao butter.

**Syrupi** (**Syrups**) contain medicinal substances in concentrated solutions of sugar.

**Tincturæ** (**Tinctures**).—Alcoholic solutions of non-volatile substances; the *tinctura iodi* is an exception, iodine being volatile.

**Tincturæ Ammoniatæ** (**Ammoniated Tinctures**).—The *aromatic spirit of ammonia* is used instead of alcohol.

**Triturationes** (**Triturations**).—Fine powders containing medicinal substances, with *Sugar of Milk* as a diluent. They are **10 per cent. in strength.**

**Trochisci** (**Troches, Lozenges**).—Solid masses of various forms composed of medicinal substances and sugar, with mucilage to bind the mass.

**Unguenta** (**Ointments**).—Preparations containing medicinal substances incorporated with a fatty base, as lard, petrolatum, etc., intended for external use.

**Vina** (**Wines**).—Preparations made like tinctures, but with red or *white wine* of a definite (U. S. P.) strength instead of alcohol as a menstruum.

## THE NON-OFFICIAL PREPARATIONS.

Of this important class the following are examples:

**Bougies.**—Elongated suppositories containing medicinal substances incorporated in gelatin and glycerin. They are intended for urethral or uterine use.

**Capsules.**—Small, elongated containers of gelatin, in two parts, intended to be filled with medicinal substances. They are convenient for administering bitter drugs, oils, etc.

**Enemata** (**Clysters, Enemas**).—Preparations with tepid water as a basis, and intended to be thrown into the rectum for local or systemic effect. Various effects may be derived from their use. When medicinal agents are intended to be given as little water as is possible (30 to 60 c.c.) should be used. Nutrient enemata of course demand the use of larger amounts of water, as is also the case when mechanical effects are desired, when as much as 500 c.c. or more are administered.

**Gargarysmata** (**Gargles**).—These are fluid preparations for application to the pharynx. Various effects may be achieved from their use as sedation, disinfection, astringent effect, etc.

**Inhalationes** (**Inhalations, Vapors**).—Medicinal agents in the form of vapor, rendered so by means of the steam atomizer, compressed-air atomizer, or by means of hot water, and intended to be inhaled.

QUESTIONS.

What are aceta?
What are alkaloids? Ptomains? Leucomains?
What are aquæ? Balsama? Cerata? Charta? Collodia? Confectiones? Decocta? Elixirs? Emplastra? Emulsa? Extracta? Extracta fluida? Glucosides? Glycerita? Infusa? Linimenta? Liquores? Massæ? Mellita? Misturæ? Mucilagines? Neutral Principles? Oleata? Oleoresinæ?
How many kinds of oleoresins are there?
What is the difference between ethereal extracts and natural oleoresins?
What are pilulæ? Pulveres? Resinæ?
What is the difference between natural resins and resins obtained through the intervention of art?
What are spiritus? Suppositoria? Syrupi? Tincturæ?
What is understood by the term tinctura ammoniata? What is the method of preparation?
What are triturationes? Trochisci? Unguenta? Vina?
What are bougies? Capsules? Cataplasmata? Enemata? Gargarysmata? Inhalationes?

## THE INCOMPATIBILITIES OF DRUGS.

**Definition.**—Incompatibility is a condition which results when certain medicines are brought together in combination and between which antagonism exists. 1. Chemical. 2. Pharmaceutical or physical. 3. Therapeutical or physiological incompatibility.

**Varieties.** 1. **Chemical Incompatibility.**—Substances in this combination may react **chemically** with each other (**double decomposition**) and new substances may be formed. This is known as a **chemical incompatibility.** Generally it is unintentional, and the substances may have an entirely different character. Sometimes a chemical incompatibility may be intentional, and the new substances formed are desired by the prescriber.

2. **Pharmaceutical or Physical Incompatibility.**—At other times there occurs a change in the resulting mixture, due to the association of substances which are held in solution by different solvents, as is seen when drugs containing gums which are soluble in water are brought into contact with drugs which are soluble in alcohol, as resins. Whichever is in

excess will precipitate the other. This is known as **pharmaceutical** or **physical incompatibility.**

3. **Therapeutical or Physiological Incompatibility.**—There may be no change in the appearance of the mixture at all, but the substances which are brought together may be directly opposed to each other in their action on the economy. This is known as a **therapeutical** or **physiological incompatibility.**

## The Rules of Chemical Incompatibility.

1. The **strong mineral acids** are incompatible with *alkalies* and with the *salts of organic acids;* with *chlorates* they cause an evolution of *chlorine,* and with *alcohol* they form *ethers.*

2. **Inorganic acid salts** are incompatible with *organic bases* and their *salts.*

3. **All acids** are incompatible with *carbonates,* causing an evolution of $CO_2$; also with *sulphides,* causing an evolution of $H_2S$.

4. **Alkalies** and **alkaline salts** precipitate *pure alkaloids* from solutions of their salts; they precipitate the *soluble non-metallic salts* also from solution and *neutralize acids;* with *chloral hydrate* they form *chloroform.*

5. **Alkaloidal salts** are precipitated from solution by *tannin,* by the *alkaline hydrates, carbonates,* and *bicarbonates,* and generally by *iodides* and *bromides* and by *proteids.*

6. **Antipyrin** is incompatible with *potassium iodide, ferric chloride,* and *sweet spirit of nitre* (if acid).

7. **Arsenic** in solution is precipitated by *tannin, salts of iron,* and the *earthy metals,* as *lime* and *magnesia.*

8. **Chloral, in alcoholic solution,** is precipitated by strong solutions of *salts,* as *iodides,* and especially *bromides; alkalies* cause the formation of *chloroform* in a dry state; mixed with camphor *liquefaction* results.

9. **Glucosides** are incompatible with *acids* and *acid salts* and with some ferments, as *emulsin.*

10. **Iodides, bromides, iodates, bromates,** and **chlorates,** when

mixed with *oxidizing agents* or strong *acids*, liberate *iodine*, *bromine*, or *chlorine*.

11. **Iron salts** are precipitated by *tannic acid*, with the formation of *inky mixtures*.

12. **Tannic acid** or drugs containing it are incompatible with *all metallic salts*, especially *iron* and *lead*. *Tannin* precipitates *alkaloids*, *proteids*, and *gelatin*.

13. **Mercury** (**corrosive sublimate**) may be said to be incompatible with *every other medicinal agent*. It is, therefore, best given alone.

14. **Salts of mercury** are precipitated by *lime-water*, as the *mercuric oxides*. This is at times intentional, for there are two preparations used extensively—the **Lotio Nigra** and **Lotio Flava**.

## The Rules of Pharmaceutical or Physical Incompatibility.

1. **Alcohol** should not be added to *solutions of acacia*, or *gums*, *gelatin*, *proteids*, or *saturated solutions* of *salts*.

2. **Water** should not be added to *alcoholic solutions*, as *tinctures*, *fluid extracts*, *spirits*, etc., or to *ethereal solutions*, as *oleorsins*.

3. **Substances rich in oxygen**, as *chlorates*, *permanganates*, *bichromates*, *nitrates*, *iodates*, and *chromic acid*, should not be mixed with *readily oxidizable substances*, as *turpentine*, *glycerin*, *carbolic acid*, *sulphur*, *iodine*, or *charcoal*, as *explosive compounds* are easily formed—*i. e.*, intensely rapid oxidation occurs. *These explosions will not occur, however, in watery solutions*.

4. **Glycerin**, **carbolic acid**, and **alcohol** behave like dry substances. Dry substances may be mixed, but, while they may not explode in the hands of the pharmacist, they may do so when in those of careless persons.

5. **Pills containing easily oxidizable substances** usually have as an *excipient* some *chemically inert substance*, as clay or paraffin.

6. **Poisonous compounds** are formed at times from substances which are brought together, as *potassium chlorate* and *potassium iodide*, which form the *poisonous iodate;* and *diluted hydrocyanic acid* and *calomel* unite into mercuric cyanide, which is very poisonous.

## The Rules of Therapeutic Incompatibility.

**Definition.**—The combination of agents which are opposed to each other in their action.

An **example** would be the presence of **astringents** in a mixture containing **purgatives.** This is naturally so in the case of rhubarb, which contains rheotannic acid. Sometimes this is intentional, as is seen when **atropine** is used with **morphine** in the hypodermic administration of the latter drug. Another good illustration of therapeutic incompatibility would be the use of **pilocarpine** and **atropine.** There are many other instances which are better understood by a thorough knowledge of the action of drugs.

## ANTIDOTES.

**Definition.**—When a poison has been taken, but has not yet been assimilated, antidotes are agents which neutralize it or prevent its action in the intestinal tract, as well as its absorption into the circulation, and, after *it has been absorbed into the blood current,* overcome its effects by an opposite physiological action.

I. **Chemical Antidotes.**—These act *in the alimentary tract usually in a chemical way,* forming a new substance, *insoluble, incapable of absorption,* or *exercising any local detrimental action;* or, the product may be *soluble,* but *harmless* in every way, whether it is absorbed or not. An **example of a chemical antidote** would be the *administration of an alkali after an*

*acid*, or the administration of *tannic acid after an alkaloid*, where the resulting tannate would be insoluble or comparatively so.

II. **Physiological Antidotes.**—These act after they are absorbed, are known as antagonists, and, in order that they be so, their action must be directly opposed to that of the poison which is in the circulation and tissues.

## Antidotal Measures and Treatment.

I. **Antidotal measures** are such as are brought against the influence of a poison. They include: the *administration of the antidote*, and, if a chemical antidote has been given, an emetic administered would be an antidotal measure. This would also be the case if the emetic had been administered before the antidote. In the same manner, after a chemical antidote has been given and it is desired to sweep the resulting product out of the body, a *cathartic* administered to accomplish this would be an antidotal measure. In the same way *active and passive motion*, as is necessary in opium poisoning, or *artificial respiration* in any condition are antidotal measures.

II. **Antidotal treatment** is a term used to cover all measures which may be applied in order to overcome the action and effects of a poison. The **objects of antidotal treatment** are, therefore, *first*, if the patient is seen early enough, **to secure emesis** by the administration of agents suitable for the case, for the purpose of ridding the stomach of its contents.

Sometimes it is impossible to produce emesis by the ordinary methods, such as mustard-water, zinc sulphate, or other emetic **administered by mouth**, for the patient may be incapable of swallowing, or the stomach may not react to these measures; then resort must be had to the administration of drugs, which **injected into the circulation** cause emesis. At times it is more convenient, or the condition of the patient

may demand that the stomach tube be used and gastric lavage practised. In this case the antidote may be added to the water which is used to wash out the stomach. By this procedure much time is saved, and the object accomplished is twofold.

*Second.* If the poison has passed the stomach, which necessarily takes some time in most cases, **antidotes** and **purgatives**, which are rapid in their action, may be administered. **Catharsis** is always advantageous in ridding the alimentary tract of noxious material. After emesis has been secured the main object in view is the administration of the antidote, and if this be a chemical one, frequent removal of the stomach contents is advisable, and may be done by emetics or lavage.

*Third.* As a rule the physician does not see a case of poisoning until some time after a poison has been taken, and as a result considerable absorption has taken place. This does not necessarily mean that it is too late to administer an antidote which might act in a chemical way. Antidotes, emesis, and catharsis do much, for the drug may not be entirely absorbed, and again, many poisons are largely thrown off by the stomach and intestines, as, for instance, morphine, arsenic, and others.

In the **administration of a physiological antidote** it is well always to be governed by the severity of the symptoms present in judging the size of the dose to be given. *It is well to be cautious for it is perfectly possible to cause poisoning by the antidote.* This is frequently seen in opium poisoning, where, atropine incautiously administered as a stimulant to respiration, there suddenly arise all the symptoms of atropine poisoning.

Much depends on the proper use of physiological antidote. Usually it is advisable to resort to various supportive measures toward any function which shows signs of failure, and these must be such as are suitable to individual cases.

*As a rule a single full dose of a given antidote, proportionate with the degree of the poisoning present, followed at short intervals by small, divided doses, is the safest method. The interval of these divided doses must be increased so soon as the physiological balance between the antidote and the poison becomes apparent, or so soon as the effect of the former is the greater. As an example, a slightly ascending respiratory rate in opium poisoning will indicate a good result of atropine. While waiting for these effects to appear, antidotal measures other than mere drugs should be faithfully used.*

QUESTIONS.

What is incompatibility?
How many kinds are there? Explain.
What are the incompatibilities of the alkalies? Of alkaline salts?
What are the incompatibilities of the acids? Of acid salts?
What are the incompatibilities of alkaloids? Of glucosides? Of antipyrin? Chloral? Iodides, bromides, iodates, bromates? Tannin? Iron salts? Mercury salts?
Give examples of pharmaceutical incompatibility.
Give examples of therapeutic incompatibility.
What substances when brought together are liable to form explosive mixtures?
What are antidotes? How many kinds are there? What effects are obtained by the use of each?
What are antidotal measures?
What is antidotal treatment?
What advantage has the stomach tube in the treatment of a case of poisoning?
Does the fact that a case is not seen until quite late obviate the use of a chemical antidote and lavage? Why?
What precautions should be observed in the application of physiological antidotes?
What is understood by the term supportive measures and what should guide you in their application?
Would a correct diagnosis have much influence as to what physiological antidote should be used in a case of poisoning?
What would you consider the safest method of combating a definite toxic symptom?

## THE ADMINISTRATION OF DRUGS.

### The Peculiar Responses to Drugs.

I. **Resistance.**—In the administration of drugs it is well to bear in mind that *men bear larger doses than women, and*

*children, according to their age, least of all;* also that certain persons are peculiarly susceptible to certain drugs, and that in ordinary doses it is well to be on guard for these idiosyncrasies. As a rule, when the action of the drug is known and its first symptom makes itself manifest, if seen in time, untoward results may to a certain extent be avoided by judicious treatment. Sometimes an **entirely atypical action** of the drug is manifested.

II. **Acquired tolerance** to certain drugs results from their long use, and their continued exhibition necessitates constantly increasing doses; an **example** would be *morphine* or *cocaine.* In certain diseases, like peritonitis and cerebrospinal meningitis, enormous doses of opium are borne. Others, like *strychnine,* may be crowded to a certain limit, which varies in different individuals, but there is no necessity for increased dosage in order to secure effects.

III. **Cumulative action,** as it is called, is another phenomenon observed in the administration of drugs. After certain drugs have been administered for a time, and at that in small doses, there may appear symptoms indicative of overdosage; this may be the result of lessened oxidation and elimination, with the accumulation of large amounts of the drug in the tissues or possibly to the summation of effects. An **example** of cumulative action is seen oftenest after *digitalis;* also after *strychnine,* more rarely.

## The Avenues of Administration of Drugs.

I. **Oral Administration.**—For reason of convenience drugs are usually given **by the mouth,** for absorption by the mucous membrane of the stomach and intestines. **The rapidity of absorption after oral exhibition** is influenced by the *fulness of stomach* and the *solubility of the drug.* When the stomach is empty and in a healthy condition, substances in solution are absorbed with rapidity. Drugs soluble in the secretions of

the stomach and intestines are also quickly absorbed, but solution is first necessary. Absorption from a full stomach is necessarily slow, and often occurs chiefly in the upper part of the small intestine. Drugs which are intended to act in the intestine are usually coated with some substance insoluble in the gastric secretion in order that they may pass through the stomach and exert their influence in the intestine. *The doses stated for drugs in works on therapeutics are always mouth doses, unless otherwise specified.*

II. **Rectal Administration.**—The **rectum** may be used as an avenue for purpose of administration of medicinal substances, which are either in solution applied in the form of enemata, or as solids in the form of **suppositories**. The *dose is double that given by the stomach,* but absorption is slow and imperfect.

III. **Hypodermic Administration.**—Drugs may be administered by way of the subcutaneous tissues. This has advantages in that there is a quicker and more certain action, and also that the dosage is more exact. The *dose is half that given by the stomach.*

The method has certain **disadvantages** in that the substances must not be irritating, must be in perfect solution, and also aseptic. The latter implies freshly prepared solution which must be sterile, as also must be the needle and syringe of the instrument. Abscess formation is comparatively common and often results when rigorous asepsis has not been observed. This condition may also be due to the fact that the agent was injected in *too strong solution,* and that it was in itself a poison to the tissues in sufficient degree to cause death of the cells of the part. Substances known to be irritating are injected deeply into muscular tissue, on account of absence of sensory nerves.

IV. **Local Administration.**—Drugs may be administered **locally** for purpose of securing different effects. When it is desired to affect the skin alone and the agents are applied without friction (**enepidermic method**); or when it is desired

to affect deeper tissues, drugs are applied with friction to promote absorption, in which case the agent is usually in solution or suspension in a fatty or oleaginous basis (**epidermic** or **intraliptic method**). In this manner *local* as well as *systemic effects* may be secured, as in the case when mercury or other agents, as alkaloids, are used. The method has an **advantage** when the stomach is intolerant, or subcutaneous administration is impossible. Its **disadvantage** lies in the fact that *inexact dosage* is inevitable.

**Excipients.**—1. *When absorption is desired,* substances which aid penetration, as *oleic acid,* the *vegetable* or *animal oils,* or *adeps lanæ hydrosis,* are to be preferred. *Petrolatum,* while an excellent basis and capable of being combined with almost anything, has the disadvantage in that it is not absorbed and may be used only when local effect is desired.

2. *When local effects are desired,* it matters not what basis is used. Agents may also be applied by the *endermic method,* in which a blister is first raised and the agent applied to the denuded surface; at best, it is painful and is but little used.

V. **Administration by Fumigation.**—Some drugs are applied by means of **fumigation,** as in the cases with mercury, which in the form of calomel is capable of being volatilized.

**Disadvantage.**—Although the drug is introduced into the system, inexact dosage is unavoidable.

VI. **Administration by Inhalation.**—Drugs may be **inhaled** either for effect on the respiratory mucous membrane or for systemic effect, as the extensive blood supply of the respiratory tract favors rapid absorption. 1. *For local effect,* powders, fumes, vapors, or sprays, as well as solutions (gargles), may be used. 2. *For systemic effect* inhalation is ordinarily practised for purpose of securing anæsthesia through the vapors of chloroform, ether, nitrous oxide, etc.

VII. **Intravenous injection** may be practised, but the method is not without **dangers,** in view of the fact that different factors together, or alone, may bring about untoward results. Thus *absolute asepsis* is necessary; also the *avoidance of the*

*introduction of air* into the circulation; *feeble solutions*, for if drugs are administered they may reach the heart in too concentrated a form and overwhelm it. The method as used is applied only in **cases of emergency**, as the injection of normal saline solution in collapse from various causes, or blood in anæmia.

VIII. **Administration by Other Mucous Membranes.**—Administration may be performed through the mucosæ, as that of the *vagina*, *conjunctiva*, and elsewhere, but in these cases it is for their *local effect*.

**Disadvantages.**—It must not be forgotten that absorption occurs from these surfaces, and that symptoms showing this absorption may arise.

## DRUG ACTION.

**Essence.**—After absorption, drugs, when in contact with the tissues of the body, exert influences (undoubtedly of **chemical nature**), but which up to the present time are more or less unknown. It is possible to witness many of their effects, but the exact changes which produce these effects are obscure. Undoubtedly some **protoplasmic combination**, a selective reaction between drugs and certain tissues, results, which may be more or less permanent, and to which those effects known as the physiological action are due.

**Varieties.**—I. When brought into contact with tissues, drugs may **heighten** or **lower function**. The former is known as **stimulation** and the latter as **depression.**

**Excessive stimulation of tissues** results in depression and paralysis, but depression does not necessarily follow stimulation always, for **primary depression** is perfectly possible. The term **irritation** is sometimes employed, and is usually meant to convey the impression that stimulation is accompanied by effects indicative of cell change. This latter may be so severe as to lead to cell proliferation in those tissues.

II. Drugs may have a **local, remote,** or **general action.**

By **local action** is meant the effects produced by the drug at the point of application and before it enters the circulation. In **remote** or **secondary action** symptoms are seen which are not the result of direct action of the drug, but are secondary to the *direct effect* of the drug, as is seen when a drug which weakens the heart may cause disorder of the respiration, through deficient circulation in the medulla.

**General action** is the result produced directly upon the system-at-large by the drug after its absorption into the circulation. A term applied to drugs whose actions are entirely unknown although the therapeutic effects may be well known.

## THE CLASSIFICATION OF DRUGS ACCORDING TO THEIR ACTION.

I. **Anodynes.**—These are agents which **allay pain,** through depression of peripheral sensory nerves or through action on the nerve centres. Their action is of short duration, and sensation is not completely lost.

**Examples.**—*Aconite, veratrine, menthol,* and *belladonna* are anodynes.

II. **Local anæsthetics** differ from the anodynes in that they abolish sensibility completely for a time.

**Examples.**—*Cocaine, carbolic acid, extreme cold* produced by evaporation of substances, as ether, ethyl chloride, or ice, are local anæsthetics.

III. **Anthelmintics.**—Medicines which are used to **destroy** or **overcome intestinal worms.** Commonly they are divided into (1) **vermifuges** and (2) **vermicides.** It is possible for one to be the other according to the amount of the drug which comes in contact with the parasite and the effect which it produces. Ordinary cathartics may be vermifuges provided conditions are such as to render their expulsion a mere

matter of sweeping them out, by increasing intestinal secretion and peristalsis.

Before the **administration of anthelmintics** the bowel should be emptied by use of castor oil or other cathartic; if possible, the patient should have no, or at best a very light and easily digested, diet for a period of at least twelve hours preceding the administration of the drug, and which should be followed by a brisk cathartic some hours later, in order to remove the dead or stupefied worm.

By some the cathartic and anthelmintic are combined and administered together.

IV. **Antiphlogistics.**—This is the term which is used when measures are considered which **reduce inflammation.**

**Examples.**—This is generally done by means which influence circulation, as by *counterirritation, purgation, venesection,* by drugs like *aconite* and *veratrum viride,* which slow the circulation. It includes the use of *antiseptics* and *antiseptic measures,* which hinder the cause of the inflammation —*i. e.,* the infection.

V. **Antipyretics.**—These are agents which **lower high body temperature.** Abnormally high temperature may be lowered by **various means.** Thus (1) **by direct abstraction of heat,** as with *cold baths* or *cold applications.* This method is used extensively and is favored by many in those cases where the hyperpyrexia extends usually over an extended period of time, and where the modern antipyretics are not applicable for the reason that they are too depressing and that high, continuous fevers react least favorably to these antipyretics. (2) **By increasing heat radiation,** as by means of *sweating* or by *sponging with hot water,* we secure a dilatation of cutaneous arterioles, which expose a larger amount of blood to cooling influences. (3) **By the administration of drugs,** like *acetanilid, phenacetin, antipyrin,* etc., which act on the heat-regulating mechanism (situated in the basal ganglia) in high temperature and cause its reduction through increased output of heat (*increased heat radiation*). (4) Drugs like

*aconite, veratrum viride,* etc., which slow the circulation, *lessen heat production.* (5) Again, temperature may be lowered through the administration of *drugs which lessen metabolism* or *tissue change,* as with *quinine, alcohol, salicin,* and the *coal-tar antipyretics,* as acetanilid, antipyrin, and others. The value and reliability of these coal-tar antipyretics for this purpose are denied by many competent authorities.

VI. **Antispasmodics.**—These are agents which **allay spasm of muscle.** Their action may be **locally confined to definite parts,** as is the case with the application of *stramonium, belladonna,* and others which allay spasm of the muscular coats of the bronchi, intestines, and involuntary muscle fibre generally, or their action may be general and involve the entire muscular system, as is the case with *ether, chloroform, chloral, bromides, alcohol, camphor,* etc.

VII. **Antizymotics.**—These are agents which **check fermentative processes** of all kinds, regardless of the cause of the fermentation. **Examples:** Briefly, all agents which are *disinfectants* are *antizymotics.* **Fermentation** is a term applied to a process in which decomposition occurs in organic matter under conditions of moisture and the presence of organized bodies commonly called *ferments,* and which include the yeast plant, *fungi, bacteria,* etc.

**Varieties of Ferments.**—There are various kinds, classified as (1) **organized ferments,** which are a low class of minute, living organisms of the *vegetable kingdom* and belonging to the *species of fungi,* as the *yeast plant* and *bacteria.* They are capable of reproducing themselves. (2) **Unorganized ferments,** or **enzymes,** those which are without life and have no structure as compared to the organized. Some have their origin in the *animal economy,* as *ptyalin, pepsin, pancreatin;* others in the *vegetable kingdom,* as *emulsin,* which occurs in wild-cherry bark; *myrosin,* which is found in mustard. All have different functions.

VIII. **Astringents.**—These are substances which **contract tissues** through precipitation of the proteids of the part or

through local vasoconstriction, or both. **Examples:** The principal drugs which cause this are the *metallic salts, tannins, dilute acids,* and the *alcohols.*

IX. **Styptics.**—All astringents are **styptics** and **stop bleeding** through contraction of the part, which closes the vessels, preventing bleeding, and through exciting clotting of the blood by chemical action.

X. **Hæmostatics** are agents which are used to **check hemorrhage** at a point not accessible to local agents. The astringents are of no value when administered for the purpose of checking hemorrhage at points inaccessible. **Examples:** (1) *General measures* may be used, as *position, rest, counter-irritation.* (2) *Lowering* of *blood pressure* either by use of *nitrites* and *cardiac sedatives,* like *aconite.* (3) Drugs may be used which will *produce vasoconstriction* in the area of bleeding, or agents which act as *coagulants,* such as *gelatin* or *calcium chloride,* which are used to some extent, injected subcutaneously, in sterile solution of from 1 to 5 per cent. in strength.

XI. **Bitters.**—In this class are medicines which have little action, excepting that which is caused by their bitter taste, which *reflexly increases* the *flow of saliva* and *gastric juice,* as well as the *motility of the stomach.* Any effect which they may have is due to the increased appetite and improved digestion.

1. **Simple bitters** are those which **contain no tannic acid** in contradistinction to those which do. These are known as *gentian, calumba, quassia, taraxacum,* etc.

2. **Astringent bitters,** such as *cinchona, cimicifuga,* etc.

3. **Aromatic bitters** are those which contain a **bitter principle** and an **aromatic volatile oil.** An **example** would be *bitter orange-peel.* Aromatic bitters in their action resemble those of the simple bitters, but have the additional **advantage** of the presence of a volatile oil which increases the vascularity and secretion of the stomach, as well as gastric peristalsis.

XII. **Carminatives** are agents which **expel flatus** from the stomach and intestines. Their action is obscure, but the presence of volatile oils, which are irritant, increase gastric and intestinal peristalsis, which causes the expulsion of flatus, and not the fluid or solid contents of the bowel.

XIII. **Cathartics.**—These are agents which **produce evacuations of the bowels.** They may be divided into groups depending somewhat on the effects which they produce; the division cannot be sharp for the reason that some drugs may belong to different groups, depending on the size of the dose and on other conditions. They may be divided into:

1. **Laxatives** which are very **mild in action,** producing evacuations of almost normal consistency, but rather more frequently. Their action is almost devoid of irritation. **Examples** are the *fruits, sulphur, magnesia,* the *bland oils,* like linseed, cottonseed, and olive oil.

*Senna, cascara, rhubarb,* and *castor oil* are laxative in small doses.

2. **Purgatives.**—These are agents which **cause frequent semiliquid stools,** and by irritation increase peristalsis as well as secretion. Colic usually accompanies their action. **Examples** are *rhubarb, aloes, senna, cascara, castor oil, calomel, bile,* etc.

3. **Saline purgatives** (**hydragogue cathartics**) are those which **produce large, watery evacuations** with little irritation. Their action is mechanical and due to the accumulation of water in the bowel. An exosmosis due to the hyperisotonic solutions administered. **Examples** are *magnesium sulphate, sodium sulphate, potassium bitartrate, magnesium citrate, potassium and sodium tartrate, sodium phosphate,* etc.

4. **Drastic Purgatives.**—These are drugs which **act harshly,** causing much irritation and pain and watery stools, due to increased secretion and peristalsis. Their action is one of irritation. Large doses are very apt to cause gastroenteritis. **Examples** are *elaterium, croton oil, colocynth, scammony, gamboge, jalap, podophyllum,* etc. These agents are also

called **hydragogues** from the large amounts of water which they withdraw.

5. **Cholagogues.**—Medicines which **increase the flow of bile.** Of these there may be two kinds: the **direct cholagogues,** as *ox gall,* the *salicylates, nitric* and *nitromuriatic acids.* These act through action on the liver itself. The **indirect cholagogues** are the many cathartics which act indirectly in emptying the gall-bladder.

XIV. **The Action of Drugs on the Circulation.**—The parts of the circulatory apparatus capable of being acted upon by drugs in a manner which is distinguishable are the **heart** and **smaller vessels** (**arterioles**).

1. **Changes in Rate of the Heart's Action.**—The heart may be **accelerated** (*a*) through its *nervous mechanism,* or (*b*) by *action on the muscle itself.* (1) Thus the heart may be made more rapid in action by *depression of the vagus centre, vagus ganglia,* or *vagus endings. Stimulation* of these structures **slows the rate.** (2) The heart may be **accelerated** by *stimulation of the accelerator nerve* or the *accelerator endings. Depression* of the same **slows the rate.** (3) The heart may be **accelerated** by *increasing the irritability of the muscle* or by *increasing its power.* It may be **slowed** by *acting on the muscle in a reverse manner* (4) The heart may be **accelerated** by *increasing its coronary circulation,* and **slowed** by *lessening the same.*

2. **Changes in the Blood Pressure.**—Blood pressure **may be raised** (*a*) by *increasing the rate* and *force of the heart muscle,* (*b*) by *stimulation of the vasomotor centre,* or *terminals,* or (*c*) by *action* on *the vessel walls themselves* (*vasoconstriction*). Blood pressure **may be raised** by either of the foregoing alone. Usually one or more act together.

Blood pressure **may be lowered** (*a*) by *slowing the force* and *rate of the heart muscle,* or (*b*) by *vasomotor depression* or *paralysis,* which may be central or peripheral (*vasodilatation*).

The drugs which will cause these conditions have been

left out purposely for the reason that it is hoped that the student will refer to these statements when in doubt, and do his own reasoning.

XV. **Demulcents** are a class of agents which **soothe** and **protect irritated surfaces.** They are chiefly *gums, dextrins, starch, gelatin, isinglass,* etc. They are colloid in nature and their action is not due to any effect which they may have on the cells with which they come in contact, but rather from the fact that they are cohesive and are slowly absorbed. Their action is thus mechanical in protecting parts from irritation.

They may be **applied to** inflamed mucous membranes of the mouth, pharynx, stomach, or as the basis for enemata.

XVI. **Emollients** are bland, oily substances which are applied to the skin to **act as protectives** from irritation. They bear the same relation to the skin as demulcents do to the mucous membranes.

After their use the skin is rendered more pliable and softer, due, perhaps, to their penetration into the superficial layers of the skin, or possibly to their prevention of evaporation from the skin; or their action may be explained by the congestion which follows their application, which is accompanied by rubbing and massage. The older emollients were the *vegetable* and *animal oils* and *fats,* but other substances, as the *petroleum products,* have taken their place to a certain extent, and are preferred somewhat on account of their permanency and freedom from rancidity.

The **action of emollients** is entirely **local,** and though they may be absorbed, it is in so small amount that no effects are appreciable. The emollients are used as the means of administering other agents more active in their nature, and the method is advantageous in that they are, or should be, in solution, and as the suface of the skin is covered with an oily, sebaceous material, absorption is more rapid than is the case when medicinal substances are brought in contact with the skin in a watery solution, in which case absorption

is prevented. This is not the case with mucous membranes, where watery solutions are absorbed readily and oily solutions scarcely at all.

Emollients are used as protectives in bruises, abrasions, cuts, etc.

XVII. **Diaphoretics (Sudorifics or Hydrotics).**—These are agents which **increase the secretion of sweat.**

This may be done by *stimulating the gland cells* themselves or by *stimulation of the nerve endings* in the glands or by *stimulation of the sweat centre* in the cord either through direct or reflex stimulation; also by *dilatation of cutaneous vessels* which, through increasing the amount of blood and warmth, stimulate the gland cells to activity.

1. **Stimulation of the gland cells** is the simplest method and is accomplished by means of *vapor, hot air, hot water,* or any other agent capable of holding heat, as sand, etc.

2. **Cutaneous vessels may be dilated** by means of *alcohol* or *hot alcoholic drinks* (punch, etc.), or by means of the *nitrites,* of which the *spiritus ætheris nitrosi* holds first place. Cutaneous vessels may also be dilated through irritation of cutaneous nerves, as is seen when *aconite* in small doses is administered; or they may be dilated by means of local measures, as the *counterirritants,* such as mustard, etc.

3. The **sweat centre may be stimulated** by salts of *ammonium,* as the *citrate* or the *acetate,* of which the latter enjoys special repute, being employed as the *liquor ammonii acetatis,* while camphor may also be used.

4. The **peripheral sweat secretory nerves** may be stimulated by use of *pilocarpine. Ipecac* or *opium,* or both in combination, as the *pulvis ipecacuanhæ et opii,* are efficient diaphoretics and are much used. Their action is based on the fact that diaphoresis forms one of the features in the nauseant stage of emetics.

The **characters of sweat** will vary according to the manner in which it is produced; thus, the sweat which is produced largely through increased circulation is more alkaline and

contains less solids than that which is produced through stimulation of the sweat centre or stimulation of peripheral nerves—the result of gland action direct. This sweat is usually less alkaline and more concentrated.

XVIII. **Antihydrotics.**—These are agents which **lessen the amount of perspiration.** They act on the same parts as do diaphoretics, but in a reverse manner. As a type a peripherally acting antihydrotic is *atropine,* which acts on the nerve terminals in the glands. Alkaloids from hyoscyamus and stramonium act in a similar manner.

*Cold* is a factor in checking perspiration. There are other drugs which are used for this purpose, but whose action is obscure. *Zinc salts, salicylic acid, camphoric acid, quinine,* and *acids* are all used for this purpose.

XIX. **Disinfectants.**—These are agents which **arrest putrefaction,** either by destroying the bacteria which are the cause, or by rendering their growth impossible by changing the character of the medium upon which their development depends. There are two kinds of disinfectants—*i. e., antiseptics* and *germicides.*

1. An **antiseptic** is an agent which meets the latter conditions applying to disinfectants in that it has the power of preventing putrefaction by changing the conditions which are favorable to bacterial growth.

2. **Germicides** are agents which **destroy bacteria.** Many substances are called germicides, although they are not, for the reason that they do not destroy the spores in bacteria; whereas they may destroy the life of the bacteria themselves, while the spores may develop at a later period.

*A disinfectant is an agent, then, which has the properties of both antiseptics and germicides.*

**Action of Disinfectants.**—The most commonly used substances may be divided into *inorganic* and *organic agents.* Some possess a specific *toxic* action on bacteria, while the majority act by forming with the protoplasm of bacteria *insoluble proteid compounds.* The value of the disinfectant

will depend much on how readily it combines with the proteids of the surrounding tissues. When it does this readily, it is always at the expense of the efficacy of the agent, which is thus bound up in a combination which does not have the properties of the original substance.

**Inorganic salts,** as a rule, act by coagulation with the exception of *mercuric chloride,* which has also a specific toxic action. Almost all these salts are *deodorant,* in that they combine with the gases of putrefaction.

*Fluorides* and *borates* seem to possess a specific toxic action.

*Oxidizing* and *reducing agents,* as $H_2O_2$, $KMnO_4$, I, BrCl, in their various combinations, and *calx chlorata* exert an influence the result of dissociation and liberation of some one of their elements, usually oxygen, which in the nascent state is fatal to bacteria and all lower forms of life. This is particularly so in the case of $H_2O_2$. This is ranked by many as equal to mercuric chloride, which is easily the most efficient.

The various *coal-tar* and *wood-tar products, aromatic acids,* and *volatile oils* almost all act by coagulation of the protoplasm of the bacteria as well as the proteids of tissues.

XX. **Diuretics.**—These are agents which **increase the quantity of urine.** As the term is used, however, in a broader sense, it implies the modification as well as increasing the secretion of urine.

The **urine may be modified** (1) by rendering it acid, or alkaline, or (2) by increasing the solid, or (3) the liquid constituents of the urine or both.

The structure in the kidneys which have to do with the elimination of water, solids, etc., are (*a*) the *Malpighian tufts,* which eliminate chiefly water along with other substances, as, mainly, salts, but also small amounts of proteids and sugars; (*b*) the *epithelium of the convoluted tubules,* which possesses absorbing and excretory function, in that they absorb from the urine water and such substances as

salts which may be of use to the body, and secrete urea and uric acid. On account of the tortuous character of the tubules the urine remains in them for a long time and in contact with cells which may modify it according to the length of time it remains exposed to their influence. Thus the urine of free diuresis is low in specific gravity on account of the large amount of water which it contains, while the ratio of inorganic salts to urea will be greater. On the other hand, urine which has been in contact for a long time contains less water and inorganic solids, and a proportionately greater amount of urea; while the acidity, total as well as relative, will be greater.

The functional activity of these structures is regulated by the nervous mechanism, largely through its influence on the bloodvessels of the glomeruli through vasoconstrictor and vasodilator nerves.

**Diuretics act** (1) *through changes in the circulation;* (2) *through changes in the composition in the blood;* (3) *by directly stimulating the secretory renal epithelium.*

1. **Changes in the Renal Circulation.**—Since the secretory processes of all glands depend on the activity of the circulation through them, and in this the kidney is no exception, any drug which increases blood pressure and forces a greater amount of blood into the kidneys will naturally increase the pressure in the glomeruli and facilitate filtration, augmenting the amount of urine. The filtration of urine, then, is dependent and proportional to the pressure in the glomeruli, and this may be increased by raising general blood pressure and by dilatation of the afferent bloodvessels which supply the glomeruli. The *general blood pressure may be raised* by the use of any drug which increases cardiac efficiency, but which does not cause arteriolar constriction, or by increasing the quantity of blood. This may be done by the use of water or the use of salts which withdraw water from the tissues for their dilution, which is by no means as efficient as the first.

*Dilatation of the renal afferent vessels* may be secured by the use of *nitrites* or *alcohol.*

2. The **composition of the blood may be varied** in different ways. All substances abnormal in quantity or quality are passed into the urine as rapidly as possible. *Citric acid* is an example.

3. Drugs which **act directly on the secretory renal epithelium** have as their type *theobromine. Caffeine* is another, but its action is not constant, for, along with its stimulating action on the epithelium, it causes a constriction of the renal vessels which may diminish or inhibit the secretion. *Theobromine,* or its salt, the *salicylate of sodium* and *theobromine,* does not possess this constricting action and is to be preferred.

Other agents which cause a stimulation of the renal epithelium are those whose activity is due to the presence of *volatile oils* or *aromatic bodies* which act by irritation, large doses causing inflammation.

4. **Urinary Acidification.**—The urine may be rendered acid by *benzoic acid, salicylic acid,* and many of their *salts,* and by large amounts of *vegetable acids.*

5. **Urinary Alkalinization.**—The urine may be rendered alkaline by the use of the *alkalies,* especially *potassium* and *lithium salts. Sodium* is not as efficient as the others for the reason that it is eliminated in combination with the bile acids and also by the bronchial mucous membrane. *Ammonia* is of no value for the reason that it is broken up in the body.

XXI. **Lithontriptics** (**Antilithics**) are agents which are used for reason that they prevent the formation of concretions in the urinary passages and are even said to dissolve them after they are formed.

**Examples** are *piperazin, potassium salts, lithium salts, ammonium benzoate,* and *benzoic acid.*

XXII. **Ecbolics** (**Oxytocics**).—These are remedies which **stimulate the gravid uterus to contraction,** which results in the expulsion of the fœtus.

They differ from *emmenagogues* in that the latter are used,

or should be used, where the menstrual flow is scanty or suppressed as the result of conditions other than that of pregnancy. Many agents which are emmenagogues are used as ecbolics and *vice versa.* **Example:** *Ergot* is a typical ecbolic producing uterine contractions through action on unstriped muscle fibre as well as action on the cord centres which control uterine contractions.

Other ecbolics and also emmenagogues act generally by causing congestion of abdominal organs (the pelvic organs as well), which is the result of a primary irritation elsewhere, usually gastroenteritis.

XXIII. **Emmenagogues**, since diminution of the menstrual flow or its cessation (aside from pregnancy) may be due to different conditions, must necessarily be a class of agents which will remove the conditions whatever their nature, and which are primarily the cause. Drugs which will do this are called **indirect emmenagogues** in contradistinction from the **direct,** which act by causing congestion of abdominal viscera. This is the case with drastic purgatives and the irritant volatile oils, as turpentine, savin, pennyroyal, rue, etc.; cantharides, counterirritant applications to the pelvic region, hot vaginal irrigation, etc.

It is well to bear in mind that drastics and other irritant measures produce their ecbolic effect secondarily to a primary irritation elsewhere, and that often they act in so violent a manner as to lead to fatal results without accomplishing the object originally sought.

XXIV. **Uterine Sedatives.**—Agents which **restrain uterine contractions.** They do this through action on the cord and also through action on the muscular walls. *Opium, bromides, chloral, chloroform, viburnum prunifolium,* etc., are **examples.**

XXV. **Emetics.**—These are agents which **cause vomiting** or **emesis.** According to their mode of action emetics are classed into those which **act locally** and those which **act centrally.**

1. **Local emetics** act by irritating the muscular coats of the stomach, or by stimulation of the peripheral nerve endings in the stomach, which then reflexly excite the vomiting centre to activity. The vomiting centre may be excited reflexly in a similar manner as by irritation of nerve endings in the pharynx and œsophagus or in the gall duct, kidneys, ureters, bladder, etc.

2. **Centric emetics** are those which cause vomiting by stimulation of the vomiting centre directly through the medium of the blood, by which means they are brought in contact with it. The vomiting centre is in close proximity to the respiratory centre and seems to be related to it to some extent in that vomiting in its muscular movement is but a modified respiration.

The **act of vomiting** consists of an emptying of the stomach upward through contraction of its walls and retraction of the walls of the abdomen and diaphragm which compress the organ. With the compression there is a simultaneous relaxation of the cardiac and a closing of the pyloric sphincters. When this relaxation of the cardiac sphincters does not occur, the condition known as **retching** ensues, while emesis does not occur.

**Examples of Local Emetics.**—Almost any substance may be used as a local emetic, provided it is irritating to the stomach. Among the local emetics in common use are the *inorganic salts*, especially *zinc sulphate*, *copper sulphate*, and *tartar emetic* (*antimonium* and *potassium tartrate*).

Of the organic substances which act as local emetics are: *ipecac*, *mustard*, *digitalis*, *squills*, *senega*, and *tobacco*.

Some substances are **combined centric** and **local emetics**, as *ipecac*, *tartar emetic*.

**Examples of Centric Emetics.**—The centric action of the alkaloid of ipecac (emetin) is disputed. It is claimed that it acts as an emetic when injected into the circulation mainly by its irritating action on the alimentary tract. Other substances act only as emetics when injected into the circula-

tion. Of these *apomorphine* is the type, and its action is that of pure stimulation of the vomiting centre.

**Variations in the Effects of Emetics.**—According to their use, emetics will produce results dependent upon their method of application—that is, their *dose* and *frequency of exhibition;* thus, in the administration of emetics, nausea or vomiting, or both, may be produced. Usually the same drug will accomplish all these results. By giving an emetic in a smaller dose (one-eighth to one-tenth of the emetic dose) it is possible to induce nausea—the *nauseant stage* of *emesis* in which the secretions are increased, especially those of the pulmonary tract, sweat glands, etc. On this fact depends the use of *ipecac* as an *expectorant* and as a *diaphoretic,* or *opium* as a *diaphoretic,* or a *combination* of *ipecac* and *opium* as a *diaphoretic agent.*

**Emetics are contraindicated** in persons suffering from aneurysm, hernia when unsupported, uterine or rectal prolapse, or in diseases of the arteries (atheroma) and in peritonitis; in short, in any condition in which changes in blood pressure incident to the muscular mechanism of vomiting might be disadvantageous.

XXVI. **Expectorants.**—These are agents which **modify the character** or **quantity of the mucus of the pulmonary tract.**

Usually expectorants are said to be *stimulating* and *depressing* or *nauseating.*

1. **Stimulating expectorants** are those which are, as a rule, eliminated by pulmonary mucous membrane, increasing the vascularity at the point of their elimination, and which increases secretion and, by raising general blood pressure, they facilitate this process. *Ammonia salts,* as the carbonate or chloride, *digitalis* and *squills* are **examples.** Others act in a similar manner, but alter the character of the secretion, generally diminishing it. *Turpentine, volatile oils, resins, balsams, creosote,* and *tar* are **examples.**

*Atropine* acts in a similar manner, but *diminishes* secretion and also relieves spasm of the bronchial tubes; *hyoscyamus* and *stramonium* likewise.

2. **Depressing or nauseating expectorants** are those which **increase secretion through producing nausea.** They are of particular value when the mucus is thick and tenacious. The nauseant stage may be prolonged by administering smaller doses of emetics. About one-tenth of the emetic dose is generally given.

**Examples of nauseating expectorants** are: *ipecac, lobelia, tartar emetic, apomorphine,* and *jaborandi.*

As a rule, when given in too large doses they cause vomiting with considerable depression. Blood pressure is generally lowered by their use.

3. Many other substances are used as **aids to expectorants,** in that they exert an influence in one way or another; thus, *opium* or its alkaloids, *codeine* or *morphine,* or the artificial alkaloid *heroin,* are used in cough (which is caused, in fact, by reflex stimulation of the respiratory centre) to quiet the centre. These agents are **contraindicated** where the secretion is very abundant, for if it be not removed by coughing there is no other way of ridding the bronchi, save by absorption.

4. **Sensory respiratory irritation** may be lessened by the use of *demulcents,* as *licorice, acacia,* etc.

XXVII. **Hypnotics** (**Soporifics**).—These are agents which **produce sleep** and, when administered in large doses, most of them are **narcotic** in their action.

Hypnotics **act by** depressing the functional activity of the brain. This is done by depression of different parts of the central nervous axis. With small doses many may be confined in their action to the cerebral cortex, while larger doses involve the cord and, later, the medulla, which constitutes one danger in their use—that is, paralysis of respiration.

**Example:** Among many hypnotics *opium* heads the list, as it may be used in almost all conditions. It is particularly indicated where sleeplessness is due to pain. In nervousness, reflex irritability, excitement, etc., *chloral, sulphonal, trional,* etc., are of value. Where there is mental worry, with

sleeplessness or delirium, *hyoscyamine, hyoscine, chloral,* and the *bromides* are of value.

XXVIII. **Narcotics.**—These are agents which **produce not only sleep,** but **stupefaction** of the nerve centres. Many of these are hypnotic in smaller doses. *Opium, chloral, hyoscyamus, alcohol, cannabis indica* are **illustrative.**

XXIX. **Irritants.**—These are agents which, when brought in contact with the skin, **produce more** or **less redness** and **congestion** of the part, due to local vascular dilatation. This local dilatation may be the result of an action on the vessel wall, or on terminal nerves, or on both in combination. Usually when the vessels of the skin are dilated through the action of an irritant, those of subjacent viscera are reflexly constricted, and internal organs may be relieved in this way. This process is called **counterirritation.**

According to the severity of their action, irritants may be classed as:

1. **Rubefacients,** which **cause only congestion** and **redness** of a part, due to vascular dilatation. **Examples:** *Mustard, capsicum, spices, turpentine,* and *ammonia.*

2. **Vesicants** (**Epispastics**), which are more severe in their action and **cause exudation of plasma** from the vessels, and which collect under the epidermis and form a blister or vesicle. *Cantharides* is an **illustration.**

3. **Pustulants** (**Suppurants**) are much more severe in their action and **cause much irritation, with diapedesis** and **pustules,** which are usually discrete. **Representatives:** *Croton oil* and *ointment of antimony.*

Another class of substances whose action is still more severe is known as the class of **caustics** or **escharotics,** which destroy the structure and life of the parts to which they are directly applied. This is the result of direct chemical action. *Strong sulphuric acid, nitric acid,* the *alkaline hydrates, zinc chloride,* and *arsenic* are **types** of this class.

XXX. **Mydriatics** are medicines which **cause dilatation of the pupil,** which may be the result of external application

or internal administration. **Examples**: *Belladonna, hyoscyamus,* their *alkaloids,* and also *cocaine.* Their method of action is described under the individual drugs.

XXXI. **Myotics.**—These are medicines which **cause contraction of the pupil,** and this may result from the external application or internal administration. **Example**: *Physostigmine,* whose action is detailed in the article on it.

XXXII. **Parasiticides** (**Antiparasitics**).—These are substances which destroy **parasites.** As the term is used commonly, it is meant those parasites which infest the skin. **Representatives**: *Pediculi* are easily destroyed by means of *mercurials,* as the ointment of mercury.

The agent commonly employed for the *parasite of itch* is *sulphur,* usually in the form of an ointment. The various *balsams* are also used, as styrax, Peru, etc. *Tinea,* according to its severity, may require mild or irritant measures; for the former, *mercurials,* as the oleate or ointment of mercury, or *thymol, camphor, boric acid.* More irritant measures are *iodine,* in the tincture; *carbolic acid, croton oil, cantharides,* or *chrysarobin.*

QUESTIONS.

What do you understand by idiosyncrasy in regard to the action of drugs?

What is tolerance? What conditions influence it?

What do you understand by cumulative action?

In what different ways are drugs administered?

What conditions are necessary for the absorption of drugs from the stomach?

Which is the avenue most commonly used? Which is most exact? Which is most dangerous, and why?

What different ways are there for the local application of medicines?

What basis favors absorption best? Which least?

What is the difference in the size of a dose when administered hypodermically as compared to that of the dose by the stomach?

How does the dose per rectum differ from that administered by the stomach?

What do you understand by stimulation? Depression? Irritation?

How many actions may drugs have? Describe these actions.

What are anodynes? What is their action?

What are anthelmintics? Vermifuges? Vermicides?

What measures should usually be employed in their application?

What are antiphlogistics?

What are antipyretics? Mention some measures which are employed.
What are antispasmodics? What is their action?
What are antizymotics? What are ferments? How are they classified?
What are astringents? Mention some. How do they act?
What are hæmostatics? What measures are employed in this condition?
What are bitters? Differentiate between simple, astringent, and aromatic btters.
Mention where each variety may be used to advantage.
What are carminatives? State examples and describe their action.
What are laxatives? Purgatives? Saline purgatives? Drastics?
How do these agents act? Mention some in each class.
What are cholagogues?
What is the difference between a direct and an indirect cholagogue?
What are demulcents?
What substances are they in most cases?
What is the nature of these substances?
What is their action and what are their uses?
What are emollients? How do they differ from demulcents?
What is their action? Where may they be used to advantage?
What are diaphoretics? In how many ways may diaphoresis be induced?
What is the simplest method for stimulating gland cells?
How are cutaneous vessels dilated?
Mention some drugs which act directly on the sweat centre.
Mention a drug which acts on the peripheral secretory nerves.
On what basis is the action of the pulvis ipecacuanhæ et opii explained as a diaphoretic?
How is the character of the sweat varied? What are these variations?
What are antihydrotics? Mention some and explain their action
What are disinfectants? What are antiseptics? What are germicides? Explain in detail the difference between these three.
What is the action of these substances?
What are diuretics? What is the broad meaning of the term?
How do diuretics act? Explain each in detail.
What agents would be used to render the urine acid? Alkaline?
What are lithontriptics? Antilithics?
What are ecbolics? What are emmenagogues?
How should a typical ecbolic act? How do most of them act?
Is there any danger in their use? In what does this danger consist?
What is understood by a direct emmenagogue? Indirect?
On what theory is the action of indirect emmenagogues based?
What are uterine sedatives? Mention some.
What are emetics? How may they act? Explain the action of a local emetic? Centric? How is retching produced?
Mention some drugs which are local emetics; centric; both.
How may nausea be produced? Is there any advantage in this? If so, explain.
What are some contraindications in the use of emetics?
What are expectorants? How may they be classified?
To which variety does digitalis, squill, ammonium chloride, etc., belong? How do they act?
What are the nauseant expectorants? How do they act?
What other substances are used as aids to expectorants? How do they act?
What disadvantage has opium when used in cough?

What are irritants? How may they be classified?
What are rubefacients? Vesicants? Epispastics? Pustulants? Caustics?
What are mydriatics? How do they act?
What are myotics? How do they act?
What are hypnotics? What is their action?
What are narcotics? How does a narcotic effect differ from a hypnotic effect?
Mention some drugs prominently used as both.
What are parasiticides? Mention some drugs used as such.

# CHAPTER III.

## THE IMPORTANT DRUGS IN MEDICAL USE.

### ACACIA (GUM ARABIC).

**Source.**—A *gummy exudation* from *Acacia senegal,* a shrub of Africa.

**Form.**—Roundish or amorphous pieces, or irregular fragments of various size, more or less transparent, usually white or yellowish. Is hard, brittle, pulverizable, nearly odorless, and insipid in taste.

**Solubility.**—It is usually *granulated* or *powdered.* The latter is the less soluble in water, because of the high heat necessary to powder, which converts the *soluble constituent, arabin,* into *insoluble cerasin.*

Acacia is *insoluble* in alcohol, ether, chloroform, and oils; slowly, but completely, *soluble* in water. Diluted alcohol, in which 100 parts contain 22 per cent. of alcohol by volume, dissolves 57 parts of the gum and 40 per cent. by volume dissolves 10 parts, while 50 per cent. dissolves only 4. (Flückiger.)

**Reaction.**—Aqueous solutions are acid and become sour, due to the formation of *acetic acid.*

**Composition.**—Chiefly *arabin*—a combination of *arabic acid* with calcium and magnesium.

**Incompatibility.**—Alcohol and strongly alcoholic liquids. Solutions of borax gelatinize solutions of acacia. Solutions of lead subacetate precipitate arabin.

**Uses.**—That of a demulcent on *gastrointestinal* and *genitourinary mucous membranes;* thus it is useful in *diarrhœas, dysentery,* and all forms of *genitourinary irritation,* and in *faucial catarrhal conditions.*

**Official Preparations.**

**Mucilage Syrup.** **Dose.**—Ad libitum.

## ACETANILIDUM (ACETANILID, PHENYLACETAMIDE, ANTIFEBRINE).

**Source.**—*A monacetyl derivative* of *anilin*, obtained, briefly, by heating together anilin and glacial acetic acid.

**Form.**—White, shining laminæ or crystalline powder, odorless, of faintly burning taste; permanent in the air; neutral in reaction.

**Solubility.**—In 179 parts of *cold water*, 2.5 parts of *alcohol*, 12 parts of *ether*, and 5 of *chloroform* at 25° C.

**Toxic Action.**—The *internal* use of acetanilid is not without evil effects at times in those who have an idiosyncrasy for the drug, or when large does have been taken. There have been observed *various skin eruptions*, as *erythema*, *itching patches*, or *widely diffused hyperæmias*, resembling the onset of *scarlatina* or *measles*. Symptoms of *collapse* may supervene which, in **milder cases**, is accompanied by a *cool skin; small, rapid pulse;* the condition is transient. In more **severe cases** the skin is *cyanosed;* the face becomes *livid* and *anxious;* the skin feels cool and is *covered* with a *clammy sweat;* the heart is *weak, irregular*, and *slow*, with a *pulse corresponding;* while a *dilatation* of *cutaneous vessels* may be observed, all accompanied by *profound prostration* There may be *convulsions* and *tremors*.

**Physiological Action.**—I. *Externally* applied, no effect is observed, except, possibly, slight sedation.

II. *Gastrointestinal Tract.*—Taken dry on the tongue it produces a feeling of mild burning, and when swallowed the same effect may be observed. It is non-irritating.

III. *Circulatory System.*—1. *Blood.* In therapeutic doses it has little action upon the blood, and the red corpuscles are unaffected. Idiosyncrasy or large doses cause the *reduction* of *hæmoglobin* to *methæmoglobin*, and the blood assumes a venous character, while its *normal alkalinity* is *decreased.* 2. *Heart and bloodvessels.* The heart is at first accelerated and then slowed, due to a direct effect upon the heart muscle. 3. Blood pressure varies accordingly.

IV. *Nervous System.*—Its action upon the nervous system is imperfectly understood, but a depressing effect on *nerve centres* is supposed to take place on account of the *drowsiness* and *lessened movements* seen in man and animals. This effect may in no way be compared to that of the narcotics. The *convulsions* seen after toxic doses may be due either to spinal excitation or to changes produced in the blood by the accumulation of toxic waste material, the direct result of the impairment of function of red corpuscles. The *cyanosis* seen after large doses is not satisfactorily explained. It is said to be due to the formation of methæmoglobin; but this cannot always be demonstrated by spectroscopic examination.

V. *Temperature.*—Acetanilid has no effect upn normal temperature. When heat production is in excess of dissipation, in some unknown manner, it causes a great increase in heat dissipation, attained by a dilatation of cutaneous vessls.

VI. *Respiration.*—Medicinal doses have no effect. Toxic doses produce rapid and shallow respirations.

**Uses.**—I. *Externally*, is *antiseptic*, and may be used as a dressing on any surface which is not *too large*, for it is absorbed and liable to cause untoward symptoms. II. *Internally*, is an antipyretic, but must be used with care, if used at all, in *sthenic fevers.* It is unsafe in asthenic fevers. It may be used with good effect in the first stages of *pneumonia* or *acute bronchitis.* In *headache* and *neuralgic pain* it is especially useful, as well as in the pains of *neuritis, lumbago, gastritis, dysmenorrhœa, sciatica*, and *tabes dorsalis.*

It acts much like salicin or salicylic acid in rheumatism in *relieving pain* and *reducing temperatures*. It may be used to advantage in *chorea* and *epilepsy*, especially when the latter is accompanied with high arterial tension. In *influenza*, with *synergists* like caffeine or salol, or a laxative, it acts very well.

**Administration.**—Acetanilid is best prescribed in combination with caffeine or strychnine, to avoid any possible untoward effect which may arise through idiosyncrasy.

**Dose.**—Antipyretic or anodyne, 1 to 10 gr. (0.06 to 0.60 gm.) is the average.

## ACETPHENETIDINUM (PHENACETIN, PARAÄCETAMIDOPHENETOL).

**Source.**—An *indirect phenol product*, obtained by the action of acetic acid on *paraphenetidin*, a body obtained from *phenol*.

**Form.**—White, crystalline scales or powder, odorless and tasteless.

**Solubility.**—*Soluble* in 12 parts of *alcohol*, 925 parts of water at 25° C.

**Action and Uses.**—Similar to acetanilid, but is considered safer.

**Toxicology.**—Very like that of acetanilid.

**Dose.**—1 to 10 gr. (0.06 to 0.60 gm.).

## ACIDUM CITRICUM (CITRIC ACID).

**Source.**—A *tribasic acid*, usually prepared from the *juice* of limes or lemons. It should not contain less than 99.5 per cent. of pure citric acid.

**Form.**—It exists as colorless, translucent, right-rhombic prisms; odorless, having an agreeable, purely acid taste.

It is very **soluble** in *water* and *alcohol;* is *deliquescent* in moist air and *efflorescent* in warm air.

**Dose.**—5 to 15 gr. (0.30 to 1 gm.).

### Official Preparation of Citric Acid.

**Syrupus Acidi Citrici.**

**Action.**—*Locally* and *concentrated* it is an irritant. *Internally in small doses* it increases the salivary and gastric secretions. It is *absorbed from the stomach* in small quantities, and usually in proteid combination. Larger amounts, if not entirely absorbed from the stomach, reach the intestine, and are absorbed as the potassium or sodium salt, or in proteid combination. *Very large doses* cause symptoms of irritation in the intestinal tract, with flatulence, abdominal pain, and at times diarrhœa. In the *circulation* the acid proteid combination, or its salts of potassium or sodium, lower the alkalinity of the blood temporarily, and this is regained largely through neutralization with ammonia, formed through tissue oxidation. Until all excess is neutralized, elimination, as ammonium, potassium, or sodium salts, takes place through the *kidneys*, increasing both water and solids, as well as the acidity of the urine.

Alkalies act in a similar manner; they are neutralized in the stomach by the hydrochloric acid, and their excess absorbed as a proteid combination; ammonia formation is retarded, and the excess is thrown off by the kidneys. *Thus both acids and alkalies are diuretic.*

After neutralization of acid combination in the blood, citrates are decomposed to the carbonates, and large amounts of these again act as diuretics.

The long-continued administration causes emaciation and anæmia.

**Uses.**—Citric acid is used as a *refrigerant* and *diuretic* in *fevers* not through any action of its own, but from the fact

that the ingestion of larger quantities of water are possible. after its use. Citric acid is used as an *antiscorbutic*, as an efficient remedy in *acute rheumatism*.

## TARTARIC ACID.

What has been said of citric acid applies also to tartaric acid, as to action and uses.

For description see p. 80.

## ACIDUM HYDROCYANICUM DILUTUM (DILUTED HYDROCYANIC ACID).

A liquid composed of not less than 2 per cent. by weight of absolute hydrocyanic acid and about 98 per cent. of water.

**Sources.**—It may be made extemporaneously by taking silver cyanide, 6 gm.; diluted hydrochloric acid, 15.54 c.c., and distilled water, 44.10 c.c. It is usually made by distilling solutions of potassium ferrocyanide and sulphuric acid. It has various vegetable sources, as prunus serotina, laurocerasus, oleum amygdalæ amara, etc.

The acid should be kept in amber, cork-stoppered bottles in a cool place.

**Action.**—Hydrocyanic acid concentrated, potassium cyanide, or other salts are similar in their action, but the salts are not as toxic nor so rapid.

In very large doses hydrocyanic acid kills within a few moments of its administration, with a simultaneous arrest of *circulation* and *respiration*. In *smaller amounts* it produces an acrid, burning taste in the mouth, with salivation, followed by numbness. Nausea and vomiting follow, with giddiness, headache, dyspnœa, and muscular weakness: the pupils are dilated; the countenance is cyanosed. Insensibility follows, then convulsions; finally paralysis and death. In *medicinal doses* there is no effect upon the *nervous sys-*

*tem.* In larger doses the *cerebrum* seems chiefly affected; a primary stimulation is followed by depression. The *convulsions* seen are no doubt cerebral in origin. They may be due to a direct action, or secondary, the result of a disturbed circulation through the brain, or to asphyxia.

The *local* benumbing effect of the acid is due to a direct paralyzing effect on *sensory nerves,* and is produced only by application of acid of some concentration.

*Respiration.*—Its action seems to be confined to the lower portion of the brain, as the medulla. In *small doses* respiration is quickened and deepened. In *large doses* the primary stimulating effects quickly pass off and depression sets in with dyspnœa, irregular breathing, becoming slower and deeper, and finally cease, due to paralysis of the respiratory centre.

*Circulation.*—As there is a primary stimulation of the medulla, with the cardiac inhibitory centre involved, a slow *pulse* ensues. There is also a rise in *blood pressure,* due to increased activity of the vasoconstrictor centres. Stimulation is soon followed by depression of the vasoconstrictor centres, with a fall of blood pressure. The *rhythm* is not increased on account of depression of vagal centres, the *heart* itself being now affected, becoming paralyzed and stopping in diastole.

*Blood.*—If death takes place soon after administration, all the blood of the body is bright red in color. When, however, death does not occur until some time after, the opposite condition prevails and the blood is venous in color. As shown by Geppert, "a change occurs in the protoplasm of the tissues, which retards the normal respiration of the cells, so that they are unable to absorb the oxygen brought to them by the blood cells." The blood therefore remains arterial in color, as is seen after a lethal dose. When, however, the result is not fatal, the tissues recover and the interchange of gases is resumed. When hydrocyanic acid is added to blood outside of the body it darkens, due to formation of cyanmethæmoglobin. This was supposed at one time to

be the cause of the venous hue, but its presence cannot be demonstrated by the spectroscope.

*Treatment of Poisoning.*—Artificial respiration immediately; while this is going on, emetics in large doses, or insert finger into the throat to cause vomiting. Agents acting against *collapse;* they must be quick in action, as ammonia inhaled; ether or brandy hypodermically. Give sodium sulphite or the hyposulphite, which form possibly the innocuous sulphocyanide.

**Therapeutic Uses.**—*Externally* used as a lotion (1 : 50 of water); it is used as an *antipruritic* and in *neuralgia,* provided the skin is not abraded. It may be inhaled in the form of a vapor from a water solution (1 : 10) in *asthma* and *irritative coughs.*

*Internally,* in *obstinate vomiting* and *gastrodynia,* in *bronchitis* and *pertussis.*

**Dose.**—2 to 4 ♏ (0.22 to 0.25 c.c.), repeated with caution.

## ANTIPYRINA (ANTIPYRIN).

Phenyldimethylpyrazolon, obtained by the condensation of phenylhydrazine with acetoacetic ether, and methylation of the product. A colorless, almost odorless, crystalline powder or tabular crystals, with a slightly bitter taste.

It is soluble in less than 1 part of water, 1 part of alcohol, 1 part of chloroform, and 30 parts of ether at 25° C.

**Incompatibility.**—With *spirit of nitrous ether* when acid, forming a blue color or precipitate, which changes to a dark-green color, and called *isonitrosoantipyrin,* which is harmless. Also incompatible with *carbolic acid and tannin.*

**Action.**—*Internally,* similar to acetanilid; *externally,* it is said to *produce anæsthesia* when applied to mucous membranes in solutions of from 20 to 40 per cent. It is not stated how it produces anæsthesia. It is *hæmostatic* when

applied to mucous membranes in solution of from 5 to 20 per cent., contracting only small bloodvessels.

**Dose.**—5 to 20 gr. (0.30 to 1.30 gm.).

## ACIDUM ACETICUM (ACETIC ACID).

Three acids are official and in active use:

I. **Acidum Aceticum.**—A liquid **composed** of 36 per cent. of *absolute acetic acid* and 64 per cent. of *water.*

**Source.**—The destructive distillation of wood, or by the oxidation of ethyl alcohol.

**Form.**—A clear, colorless liquid, with the odor of vinegar; of purely acid taste and an acid reaction. Is *miscible* in all proportions of alcohol and water.

II. **Acidum Aceticum Glaciale (Glacial Acetic Acid).**

**Form.**—A clear, colorless liquid and nearly or quite absolute. Is solid and glassy below 59° F. (15° C.).

**Source.**—Usually from acid potassium acetate.

III. **Acidum Aceticum Dilutum (Dilute Acetic Acid).**—**Contains** 6 per cent. by weight of absolute acetic acid.

**Dose.**—1 to 2 dr. (4 to 8 c.c.).

**Action.**—Resembles that of citric acid, which see.

**Uses.**—*Concentrated,* as an active *escharotic. Dilute acetic acid* is excellent as a *topical* application in *dermatitis, sunburn,* etc. *Internally* it acts as a *refrigerant,* allays *restlessness,* and quenches thirst; long-continued administration produces emaciation. The glacial acid is used as a *caustic* in *destroying warts* and *condylomata,* as well as the parasite in *ringworm* and *pityriasis.*

## ACIDUM BORICUM (BORIC ACID).

**Source.**—Found free in nature. Is largely obtained from **borax.**

**Form.**—Transparent, colorless, pearly, lustrous plates, unctuous to the touch, permanent in air, odorless; of coolish, bitterish taste, and feebly acid in reaction.

**Dose.**—5 to 15 gr. (0.30 to 1 gm.).

**Solubility.**—18 parts *water*, 15.3 parts *alcohol*, and 4.6 parts *glycerin* at 25° C. Its solubility may be increased by the addition of hydrochloric acid or borax.

### Official Preparations of Boric Acid.

**Unguentum Acidi Borici**, 1 per cent.

**Sodii Boras (Sodium Borate, Borax).—Occurs** native in Tuscany, California, and elsewhere.

**Form.**—Milk-white, transparent prisms, odorless, of sweetish and alkaline taste, and efflorescent.

**Solubility.**—Is *soluble* in water and glycerin; *insoluble* in alcohol.

**Dose.**—5 to 30 gr. (0.06 to 2 gm.).

**Glyceritum Boroglycerini (Glycerite of Boroglycerin).—Prepared** by heating together boric acid and glycerin. It contains 31 per cent. of boric acid, and is a sweet, viscid, colorless liquid.

**Uses.**—1. *Boric acid* as an *antiseptic* is but slightly irritating, and in saturated aqueous solution may be used locally in any cavity, as in *cystitis;* in *conjunctivitis.* It may be used as a *surgical dressing.* Is useful in *eczema, burns* and *scalds*, and in *fetid perspiration.* 2. *Borax* may be used locally as a wash in *tonsillitis, aphthous stomatitis,* and in *pruritus pudendi.* With water it forms a sedative lotion in *freckles, acne,* and *leucorrhœa;* and *internally* it has been given in *epilepsy, dysmenorrhœa,* and *amenorrhœa.* 3. *Glycerite of boroglycerin* is used to advantage *externally* as an *antiseptic,* and as a *vehicle* for carbolic acid, chrysarobin, alkaloids in the treatment of skin diseases, in diseases of the eyes, as *purulent ophthalmia,* and as a *local hydragogue* and *counterirritant* in *endocervicitis* and *endometritis.*

## ACIDUM HYDROCHLORICUM (HYDROCHLORIC ACID, MURIATIC ACID).

**Form.**—A liquid *composed* of 31 per cent. by weight of absolute hydrochloric acid and 68.1 per cent. of water. Is a fuming colorless liquid, with a pungent odor and an intensely acid taste and reaction.

**Acidum hydrochloricum dilutum** contains 10 per cent. by weight of absolute hydrochloric acid.

**Dose.**—5 to 20 ♏ (0.30 to 1.20 c.c.).

## ACIDUM SULPHURICUM (SULPHURIC ACID, OIL OF VITRIOL).

**Form.**—A heavy, colorless, and odorless liquid *composed* of 92.5 per cent. by weight of absolute sulphuric acid, and not more than 7.5 per cent. of water.

**Acidum sulphuricum dilutum** contains 10 per cent. by weight of absolute sulphuric acid.

**Dose.**—10 to 30 ♏ (0.60 to 2 c.c.).

**Acidum sulphuricum aromaticum** contains 20 per cent. of sulphuric acid, also 7 per cent. of alcohol, with oil of cinnamon and tincture of ginger.

**Dose.**—5 to 15 ♏ (0.30 to 1 c.c.).

## ACIDUM NITRICUM (NITRIC ACID).

**Form.**—A liquid *composed* of about 68 per cent. by weight of absolute $HNO_3$ and 32 per cent. of water. It is colorless, fuming, very caustic and corrosive, of peculiar suffocating odor, and strongly acid reaction, and acquires a yellowish color on exposure.

**Acidum nitricum dilutum** contains 10 per cent. of absolute $HNO_3$.

**Dose.**—5 to 30 ♏ (0.30 to 2 c.c.).

## ACIDUM NITROHYDROCHLORICUM (NITROHYDROCHLORIC ACID, AQUA REGIA).

**Form.**—Is a golden-yellow, fuming, and very corrosive liquid, having a strong odor of chlorine and a very acid reaction; *composed* of 18 volumes of $HNO_3$ and 82 volumes of hydrochloric acid.

**Dose.**—1 to 3 ♏ (0.06 to 0.18 cgm.), well diluted.

**Acidum nitrohydrochloricum dilutum** contains $HNO_3$, 4 volumes; hydrochloric acid, 18.2 volumes; water, 78 volumes; is a colorless or faintly yellow liquid, odorless, or of faint odor of chlorine; a very acid taste.

**Dose.**—5 to 30 ♏ (0.30 to 2 c.c.).

**Action of the Mineral Acids.**—The strong mineral acids *externally* applied are active as escharotics. *Sulphuric acid* completely disorganizes all organic structures, producing a white eschar, which later changes to brown or black, and penetrates deeply. *Nitric acid* produces a yellow eschar. Sulphuric and hydrochloric acids are seldom used as escharotics, nitric being preferred as a caustic on *chancres, warts, phagedenic ulcers, hemorrhoids,* and other growths.

*Internally,* the *strong acids are never used medicinally.* The dilute solutions all have a characteristic taste, and reflexly increase the flow of saliva. They are all *synergetic to pepsin,* and they all displace the weaker acids from their combinations. They are all said to increase the flow of the alkaline secretions, such as the bile and intestinal secretions. Particularly is this said to be so of dilute nitric, hydrochloric, and nitrohydrochloric acid.

They are *absorbed* from *the alimentary tract in combination,* as salts, and *circulate as such in the blood.* The alka-

linity of the blood is lowered, and, until it regains its normal by neutralization from the alkalies of the tissues and blood, the acid salts as such are *eliminated rapidly by the kidneys*, often with a considerable degree of irritation, as is seen by the albuminuria, hæmaturia, and at times even suppression. In its reaction the urine is acid.

The increased amount of salts in the urine act as *diuretics* as long as there is an excess of salts in the blood.

**General Uses of the Mineral Acids.**—**Dilute hydrochloric acid** may be used with pepsin in *atonic dyspepsia* and *indigestion* due to a diminished secretion of acid.

**Dilute nitric acid** and **dilute nitrohydrochloric acid** are used internally in *hepatic torpor* and *intestinal indigestion, duodenal catarrh, catarrhal jaundice*, and as a bath in the early stages of *hepatic cirrhosis*. **Aromatic sulphuric acid** is particularly useful on account of its astringent effect upon the bowel, in *serous diarrhœa, dysentery*, and *cholera*. It may be given alone or in combination with vegetable astringents and opium.

**Toxicology of the Mineral Acids.**—*Internally* and *concentrated* the symptoms of hydrochloric, nitric, and sulphuric acids are much the same, and treatment has to deal with present conditions, then ulcerations, and later with their direct results—strictures in the œsophagus and stomach.

The **early symptoms** depend upon the degree of concentration of the acid taken, and appear immediately. There is a burning in the mouth and throat, with intense pain in the stomach, attended with vomiting of brownish or blackish matter—*i. e.*, of altered blood, often mixed with fresh blood, mucus, and fragments of mucous membrane. There is often diarrhœa. Swallowing is painful and at times impossible.

Thirst is intense; there are shock and collapse, and the skin is cold and clammy.

**Treatment.**—*Alkalies, excepting carbonates*, to neutralize the acid.

*Albuminous drinks*, as egg-water or milk; *demulcents* to soothe and protect the surfaces; *opium* for pain; *stimulants*, as strychnine, for shock. Enemata are indicated and may be *nutrient* and *stimulating*.

The sequelæ, strictures, require surgical attention.

## ACIDUM SALICYLICUM (SALICYLIC ACID).

**Sources.**—A monobasic *organic acid*, existing naturally in combination in various plants, but generally **prepared from** *sodium-phenol* by the action of *carbon dioxide*, or from the *oils of wintergreen* and *birch;* also from *salicin* by fusion with *potassium hydrate*.

**Characters.**—Fine, white, light, prismatic crystals or powder, permanent in air, of gaultheria-like odor, with a sweetish, afterward acrid, taste, and acid reaction.

**Solubility.**—In 308 parts of water at 25° C.; 14 of *boiling* water, freely in *glycerin*, *alcohol*, *ether*, and 80 parts of *chloroform*.

**Action.**—As an *antiseptic*, salicylic acid is of great value in retarding putrefaction in proteids, and acetic and alcoholic fermentation, when present in but very small amounts.

I. *Externally* applied to the skin it is an *antiseptic* and *parasiticide;* when left in contact it induces corrosion and necrosis. It is an irritant to mucous membranes.

II. *Internally*, the acid and its salts are *rapidly absorbed* from the stomach and intestines, usually without untoward symptoms, when administered in **medicinal doses.** In **large doses**, or when an *idiosyncrasy* exists, there may be a feeling of fulness in the head, hissing and roaring in the ears (*tinnitus aurium*), deafness, disordered vision, all resembling *cinchonism*, and called *salicinism*. There may be a sensation of undue warmth, with excessive perspiration; symptoms of collapse may supervene, with dyspnœa, subnormal temperature; slow, weak pulse, and finally unconsciousness.

There may be restlessness and delirium. The *urine* is stained a dark olive green.

The *disorders of hearing* and *sight* are not entirely due to its cerebral effect. In the first case it is due to congestion of the auditory canal, while the sight is impaired, the result of a constriction of the retinal vessels.

On general *blood pressure*, its first effects, in *small quantities*, are to raise it, due to stimulation of the vasoconstrictor centre, and the fall seen after large quantities is due partly to depression of the same centre, and partly to its depressing action upon the heart.

The vessels of the skin are dilated in the same way as by acetanilid. *Respiratory* effects seen are due to a primary stimulation. Toxic doses are followed by depression and paralysis of the respiratory centre, death being due to this result.

*Temperature.*—Normal temperature is not affected, but high temperatures are lowered, due partly to dilatation of cutaneous vessels and partly to increased heat radiation. The perspiration induced is largely due to this dilatation of cutaneous vessels, and which also explains some of the skin rashes seen.

*Urine.*—The urine is somewhat *increased*, which is probably due to a stimulation of the renal epithelium. *Large doses* are apt to irritate the kidney, causing the appearance of albumin and blood in the urine. The *olive-green color* of the urine is due to indican or else pyrocatechin. The latter undoubtedly arises from salicylic acid itself by the action of the pancreatic juice.

The acid is *absorbed* and *circulates in the blood* as alkaline salicylates and is *excreted* by the kidneys *partly* as salicylic acid, *largely* as the glycocoll combination or salicyluric acid. Salicylic acid is also found in the perspiration, milk, and bile.

**The Official Preparations of Salicylic Acid.**

**Sodii Salicylas.** **Form.**—A white, odorless powder, with a sweet taste; **soluble** in water, alcohol, and glycerin.

**Dose.**—1 to 60 gr. (0.06 to 4 gm.).

**Lithii Salicylas.** **Form.**—A whitish, odorless, deliquescent powder, very **soluble** in water and alcohol.

**Dose.**—1 to 15 gr. (0.06 to 1 gm.).

**Methylis Salicylas** (**Artificial Oil of Wintergreen**), an oily liquid, resembles—

**Oleum Gaultheriæ** (**Natural Oil of Wintergreen**) is a volatile oil distilled from the leaves of *Gaultheria procumbens*, and **consists** almost entirely of methyl salicylate (90 per cent.).

**Dose.**—1 to 5 gr. (0.06 to 0.30 c.c.).

**Oleum Betulæ** (**Oil of Betula**), obtained from *Betula lenta*. **Composed** entirely of methyl salicylate.

**Dose.**—1 to 5 gr. (0.06 to 0.30 c.c.).

**Phenylis Salicylas** (**Phenyl Salicylate, Salol**)—An almost tasteless, white, crystalline powder, with a faint aromatic odor, soluble in 2333 of water, in 5 of alcohol at 25° C. Soluble in ether, fixed oils, and sodium hydrate. **Contains** 36 parts of *phenol* and 64 parts of *salicylic acid*.

**Dose.**—2 to 10 gr. (0.12 to 0.60 gm.).

It resembles salicylic acid in its **action** on the economy, but causes no gastric disturbances. It is said to be unaffected by the gastric juice and to pass unchanged through the stomach. This is, however, not always so. It is decomposed by the pancreatic juice into its component parts, each of which are antiseptics.

**Salicinum.**—A glucoside **obtained** from *Salix* and *Populus*, is a white, odorless, crystalline substance, very bitter, and **soluble** in water.

**Dose.**—15 to 30 gr. (1 to 2 gm.).

**Uses of Salicylic Acid and its Preparations.**—*Externally*, as an *antiseptic* in the form of an ointment (1 to 8) with soft petrolatum, is very efficient in *erysipelas* and other phleg-

mons. As a dusting powder it is very useful in *chancroid* and other *phagedenic ulcers*. By its desquamating action on the skin, it may be used to remove *callosities, warts, corns,* and in *indurated eczema.*

It is very useful at times in *eczema* of the moist or weeping variety, also in *psoriasis, lupus, impetigo,* and *parasitic affections.*

*Internally,* salicylic acid is extensively used in *acute articular rheumatism,* in *lumbago, sciatica,* and in *migraine.* It is *useful in pleural effusions,* serous in character. Applied as a lotion in *quinsy,* rheumatic in its origin; in *stomatitis;* in *pruritus,* either anal or vulval; applied to *acutely inflamed rheumatic joints,* it is very efficacious; also in *bromidrosis.*

It has been used with success as an *anthelmintic* in tapeworms and round-worms.

*Sodium salicylate* in its action is similar to salicylic acid, but is less irritant.

*Lithium salicylate* is supposed to be of more value in *chronic rheumatic conditions* and *gout.*

*Oil of wintergreen* and *oil of betula,* as well as *methyl salicylate,* have much the same action as salicylic acid, and are used for the same conditions as the acid excepting that they do not have any local corrosive action.

## ACIDUM TARTARICUM (TARTARIC ACID).

**Source.**—A dibasic *organic acid* usually prepared from *argol* or *crude cream of tartar,* which forms in wine-casks.

**Characters.**—Nearly colorless crystals or crystalline crusts, or white powder, odorless, an acid taste and reaction; permanent. Is soluble in water and alcohol.

**Dose.**—10 to 15 gr. (0.60 to 0.90 gm.).

Its action is similar to citric acid, which see.

**Uses.**—*Refrigerant;* a substitute for citric acid in effervescent draughts. It enters into *pulvis effervescens compositus,* or Seidlitz powders.

## ACONITUM (ACONITE, MONKSHOOD).

**Sources.**—The dried *tuberous root* of *Aconitum napellus;* collected in autumn; yielding, when assayed, not less than 0.5 of aconitine. Habitat, Europe and Asia.

The alkaloid *aconitine,* which represents the activity of the drug, may be broken down into acetic acid, benzoic acid, and **aconine.**

Aconitine is the most powerful alkaloid known. It exists in the form of white rhombic tables or prisms, odorless and permanent. The alkaloid itself should never be tasted, and its solutions only when largely diluted, and then with caution. It is very variable in strength. The average dose of an active specimen being 0.0001 to 0.0003 mgm. ($\frac{1}{640}$ to $\frac{1}{200}$ gr.).

**Action.**—Applied to the tongue, there develops in a few moments a sensation of warmth which is followed by *tingling* and *prickling* and this by *numbness,* all of which are characteristic of this drug, excepting the alkaloid veratrine, which has practically the same action as aconite. In *toxic doses* the *tingling* and *prickling* is felt in the stomach, and soon extends to the fingers and finally the entire cutaneous surface. After a time the *numbness* also extends. Accompanying it there is salivation and there may be vomiting. There is extreme muscular weakness; the pulse is at first slow and may be irregular; later it becomes weak and imperceptible. The respiration becomes slow and labored, and finally ceases, death being generally preceded by convulsions.

*Externally* applied to the mucous membrane or to the skin for any length of time, it stimulates the terminals of the nerves of common sensation, thus accounting for the tingling, and later depresses the same terminals, inducing numbness.

*Internally* in *toxic doses* the same results are produced by the same action. Increased salivary secretion and vomiting are due to the irritation of sensory terminations.

*Circulation.*—In *medicinal doses*, after a very brief acceleration, the pulse is slowed, due to centric vagal stimulation, which inhibits the heart, lengthening diastole. It is only in *toxic doses* that aconite exerts a direct depressing action on the heart muscle. Owing to the fact that there is a strong vagal stimulation, there is also increased activity in the *vasomotor centre*, resulting in a primary rise in blood pressure, which is, however, masked by a marked slowing of the pulse, a direct result of cardiac inhibition. The increased activity in the floor of the fourth ventricle might also be considered a factor in the production of vomiting. Dilatation of cutaneous vessels and consequent flushing of the skin may be due to the stimulation of peripheral sensory terminations.

*Respiration* is said by some observers to be slightly stimulated by *small doses*, but this has not been proved. Breathing is slowed and becomes labored and dyspnœic either by depression of the peripheral fibres of the vagi in the lungs, or through depression of the respiratory centre. Large doses depress the respiratory centre and cause death in this way.

*Central Nervous System.*—There is no influence on the *brain* and its action on the *cord* is uncertain, the *medulla* being the only part affected.

*Temperature.*—This is reduced by the slowing of the circulation, the dilatation of cutaneous vessels, and some alteration in the heat-regulating mechanism.

*Absorption and Elimination.*—Aconite is quickly absorbed and eliminated as such chiefly by the urine.

**Treatment of Poisoning.**—Position, horizontal. Evacuate the stomach; if seen early, tannic acid as the *chemical antidote* to neutralize portions of the drug in the stomach.

Maintain bodily heat by external warmth; diffusible stimulants, as ammonia, ether, or alcohol hypodermically. *Atropine* as a physiological antidote, but should be used cautiously.

**Uses.**—1. *Externally*, aconite is employed in *neuralgia* and may be employed in the form of a liniment or tincture, or the ointment of aconitine.

2. *Internally,* in fevers resulting in acute throat affections, as *tonsillitis, pharyngitis.* Early in diseases of the respiratory tract, as *bronchitis, pneumonia;* in *pleuritis* before effusion; in *peritonitis* in combination with opium; also in *meningitis.* In the acute *exanthemata* of children.

It is very useful in *pericarditis,* in *cardiac hypertrophy,* with or without valvular lesions as a cardiac sedative. It is much praised in *acute articular rheumatism* and may be given throughout the disease.

### The Preparations of Aconite.

**Extractum Aconiti.**—**Dose,** $\frac{1}{10}$ to $\frac{1}{4}$ gr. (0.006 to 0.015 c.gm.).

**Fluidextractum Aconiti.**—**Dose,** $\frac{1}{2}$ to 2 ♏ (0.03 to 0.12 c.c.).

**Tinctura Aconiti.**—**Dose,** $\frac{1}{2}$ to 15 ♏ (0.03 to 1 c.c.).

The **ointment** and **oleate of aconitine** are *not official,* but are both of 2 per cent. strength and very serviceable.

## ADEPS LANÆ HYDROSUS (HYDROUS WOOL FAT, LANOLIN.)

**Source.**—The purified fat of the *wool of the sheep,* mixed with not more than 30 per cent. of water. It **melts** at 40° C. (104° F.).

**Form.**—A yellowish-white, ointment-like mass, having a peculiar, faint odor, and neutral in reaction. On standing its surface assumes an orange color due to loss of water. It is a *cholesterin fat* and contains no glycerin.

It has distinct advantages as an ointment base in that it permits admixture of aqueous solutions, and also that it does not become rancid.

## ADEPS LANÆ (ANHYDROUS WOOL FAT).

Contains no water, is pale yellow in color, and less tenacious.

**Uses.**—As a basis for ointments.

## ÆTHER (ETHER, ETHYLIC ETHER, ETHYL OXIDE).

**Source.**—A liquid composed of 96 per cent. by weight of *absolute ether* and about 4 per cent. of *alcohol*, containing a little water.

**Properties.**—A colorless liquid with a sweetish, burning taste, and a penetrating odor. It is volatile, inflammable; its vapor is heavy and, when mixed with air, is explosive if ignited. Its reaction is neutral. It is **soluble** in about 10 parts of water, with a slight contraction in volume. Is miscible in all proportions of alcohol, chloroform, and oils.

**Symptoms.**—The first effect in the application of ether when inhaled is a sense of suffocation and irritation of the mucous membrane of the respiratory tract; the mouth is filled with saliva from the increased activity of the salivary glands. The face is flushed. There is a roaring or ringing sound in the ears; there is stiffness of the limbs; the pupils are enlarged, the pulse is accelerated and, as anæsthesia progresses, becomes rapid and strong. The patient may laugh, cry, struggle, pray, or swear. The respirations are quickened; they may be spasmodic or stertorous, becoming slower and deeper and, later, weaker. The skin is at first moist and warm; later it becomes moist and cool. As total unconsciousness approaches, the relaxation of muscles becomes complete, reflexes are abolished, and sensation is lost, that of the eyes and mucocutaneous junctions being last to disappear.

Some hours elapse after deep anæsthesia before the patient

fully recovers his mental faculties; headache, nausea and vomiting usually follow, but the latter may be avoided by dietary measures.

**Action.** *Nervous System.*—Briefly, there is a primary stimulation, followed by a depression which affects first the cerebrum, then the cord, and finally, the medulla. In all these stages the sensory functions are involved before the motor.

*Respiration.*—Small amounts stimulate, large doses paralyze the respiratory centre. The slowing or arrest of respiration at the beginning of anæsthetization is not due to central action, but rather to reflex spasm the result of peripheral irritation of the endings of the vagi and trigemini. Early in the administration breathing is apt to be irregular, owing to excitement and struggling, but during anæsthesia it is regular, but slower and shallower than normal.

*Circulation.*—Early there is an acceleration of the pulse, which, during anæsthesia, is slower and weaker than normal. Ether causes a rise in *blood pressure,* which is usually succeeded by a fall. The rise is due to increased heart action and centric vasomotor stimulation, and the fall to depression of the same. There is usually some dilatation of cutaneous vessels.

*Eye.*—Early the pupils are dilated; during complete unconsciousness they are narrower than normal, while *dilatation* during complete anæsthesia indicates *danger* and *impending death.* Primary dilatation is considered as due to excitement; the later dilatation is not satisfactorily explained.

The pupillary reflex to light should never be totally abolished during ether anæsthesia. During operations of only moderate severity the pupil should be rather small and promptly reactive to light. If the operation is more severe the amount of ether given should be such that the pupil is moderately dilated and unhesitatingly, though more slowly, reactive to light. In operations involving shock, of marked degree—for example, such as require extensive chiselling and

pounding of bone—the anæsthesia should be maintained still more deeply, so that the pupil is well dilated, and when exposed to light slowly and deliberately contracts. A well-dilated pupil, very active in its contraction, is an unmistakable sign of slight anæsthesia. The degree of dilatation and the rapidity of contraction to light are the safest and best signs of the character of the anæsthesia. The sign of danger is not a widely dilated pupil alone, but one which refuses to react to light when so dilated, especially in the presence of respiratory or circulatory signs, or both.

*Elimination.*—Ether is chiefly eliminated by the lungs; other channels, as the kidneys, also eliminate it. Acute nephritis is not uncommon and is ascribed to the irritation of the ether on the renal epithelium.

**Uses.**—1. *Externally.* As a spray to produce *anæsthesia* by refrigeration for minor surgical operations; also for the relief of *pruritus, neuralgia,* etc.

2. *Internally,* its chief use is that of an anæsthetic. As an antispasmodic, it is occasionally prescribed, but its preparations are preferred. It has been used as an *anthelmintic* in 15 c.c. doses for *tape-worm.* It is also reliable in any condition which requires a quickly acting, *diffusible stimulant.*

### The Official Preparations of Æther.

**Spiritus Ætheris** (**Spirit of Ether**).—**Dose,** ♏ 15 to fl℥ 1 (1 to 4 c.c.).

**Spiritus Ætheris Compositus** (**Compound Spirit of Ether, Hoffmann's Anodyne**).—Contains, besides alcohol and ether, ethereal oil.

**Dose,** ♏ 5 to fl℥ 1 (0.30 to 4 c.c.).

These preparations are used in *gastralgia, flatulence,* and in *colic;* also in *syncope* and *hysteria.*

## CHLOROFORM (TRICHLORMETHANE).

**Form.**—A liquid *composed* of from 99 to 99.4 per cent. by weight of *absolute chloroform* and 1 to 6 per cent. by weight of *alcohol*. Specific gravity not below 1.476 at 25° C. It is a heavy, colorless, volatile liquid, with an ethereal odor and a sweetish, burning taste. It is not inflammable, but its vapor, when heated, burns with a green flame.

It is **soluble** in 200 parts of cold water and freely in other solvents. It dissolves rubber, oils, fats, resins, balsams, and most alkaloids.

**Dose.**—2 to 20 ♏ (0.12 to 1.20 c.c.).

### The Official Preparations of Chloroform.

**Aqua Chloroformi** (**Chloroform Water**).—A saturated solution. **Dose,** ʒj to iv (4 to 15 c.c.).

**Emulsum Chloroformi** (**Emulsion of Chloroform**).—Contains 4 per cent. **Dose,** ʒj to iv (4 to 15 c.c.).

**Linimentum Chloroformi** (**Chloroform Liniment**).—Contains 30 per cent. in soap liniment.

**Spiritus Chloroformi** (**Spirit of Chloroform**).—Contains 6 per cent. **Dose,** 15 to 60 ♏ (1 to 4 c.c.).

**Action.**—1. *Locally*, if applied and evaporation prevented, it is an irritant and vesicant.

2. *Internally. Inhaled*, its action on the *nervous system* is similar to that of ether. Its effect on the *circulation* is to lower *blood pressure* by direct depression of the heart muscle; although the vasomotor centre may be primarily stimulated, its effects are hidden by the cardiac depression; later there is a paralysis of the vasomotor centre and the arterioles are dilated. Blood pressure falls. Death results from cardiac paralysis.

*Respiration.*—This is very much less disturbed than when under ether, and there is also much less faucial irritation.

In dangerous narcosis respirations *may cease* from paralysis of the respiratory centre, although death is usually the result of cardiac failure.

*Temperature.*—This is very much lowered by both ether or chloroform and is largely due to the dilated skin vessels which permit increased heat radiation; lessened movement is also a factor.

Anæsthesia and unconsciousness are produced much quicker with chloroform than with ether. The primary stage of excitement is much milder or may be absent. The pulse under chloroform is quickened at first, but as anæsthesia progresses it becomes less frequent and more or less weak. In this it differs from that of ether.

*When swallowed in small quantities* chloroform increases the secretions and also peristalsis. *Large amounts* cause a violent gastroenteritis, with symptoms partly the result of this latter condition and partly due to the absorption of the drug, which may cause coma and death.

## The Choice of Anæsthetic.

Ether is the safer. Chloroform is the quicker, as it causes less excitement than does ether; it is less irritating to the respiratory tract, does not cause so much nausea and vomiting; its vapor is not inflammable, while that of ether is, and cannot be used near an open flame. Chloroform is contraindicated in cases with fatty heart and with renal lesions. It is quite common, and, in fact, good practice, to begin with chloroform and continue anæsthesia with ether.

## The Administration of Ether or Chloroform for Anæsthesia.

The patient should have a light diet four or five hours before, so that the stomach may be empty. Clothing should

be loose, and during the operation the patient should not be exposed, but be kept as warm as possible. When ether is used, the eyes should be protected from its vapor. Ether is given as concentrated as possible, while chloroform is always diluted well with air.

**Untoward Results.**—In ether the respirations often cease; at the beginning this is reflex and of no account; withdraw the anæsthetic for a moment or two. Later, however, it is centric and of much more importance. The head is to be lowered at once to favor cerebral circulation; artificial respiration is to be begun at once. If the heart stops, amyl nitrite *should not* be given, for the blood pressure is low as it is. Caffeine or strychnine may be given hypodermically, or suprarenal gland extract intravenously.

In chloroform anæsthesia, should dangerous symptoms arise, withdraw the anæsthetic, lower the head of the patient, give strophanthus or ammonia hypodermically, or the alkaloid of the suprarenal gland hypodermically; amyl nitrite *is not* to be given.

**Uses.**—Chloroform is used to produce unconsciousness and insensibility to pain in surgical operations of all kinds; to overcome convulsions of all kinds; also as an aid to diagnosis.

Internally it is used as an *antispasmodic* in various forms of *colic*. Also protracted *diarrhœas* and in *cholera*. It should be tried in *tape-worm*, the emulsion being used and *followed* by a *cathartic*. Locally it is used as an *anodyne* in *neuralgias*. The liniment is a very useful application in *muscular pains*.

## ALCOHOL.

There are three official strengths of alcohol.

**Alcohol absolutum** should not contain more than 1 per cent. of water.

**Alcohol** contains 94.9 per cent. by volume and 5.1 per cent. of water.

**Alcohol dilutum** contains 48.9 per cent. by volume and 51.1 per cent. of water.

**Preparation.**—Alcohol is **formed** by the action of the organized ferment *saccharomycetes* on sugars and starches, under proper conditions of warmth and moisture. Fermentation—for such is the process—continues until about 18 per cent. of alcohol is formed, which kills the ferment.

**Wines.**—The product of fermentation, if formed from the juice of the grape (*Vitis vinifera*), is wine. Wine may contain much less than the foregoing percentage through dilution, or the amount of saccharine matter may have been limited. There are two wines official:

**Vinum album** (*white wine*) and **Vinum rubrum** (*red wine*) both contain the same amount of alcohol (8.5 to 15 per cent. by volume), but the white differs in that it is fermented from grape juice which has been freed from stems, seeds, and skins.

The *distillation of wines* forms the product known as:

**Brandy** (**spiritus vini gallici**), and contains from 46 to 55 per cent. by volume of alcohol. It should be at least four years old.

When fermentation takes place in grain, or a mixture of grains, as corn, rye, and wheat, the resulting product is:

**Whiskey** (**spiritus frumenti**), which contains from 44 to 55 per cent. alcohol by volume. It should be at least four years old.

**Action of Alcohol.**—1. *Externally.* Applied to the *skin* or *mucous membrane,* it abstracts water (dehydrates), and in this way is an irritant. It produces effects from that of irritation and redness to that of coagulation of the albumin of tissues, depending on the degree of concentration. This marked degree of dehydration is an evidence of its destructive action on all forms of protoplasm, wherein consists its antiseptic power.

2. *Internally.* In *small quantities* alcohol produces a sensation of burning *in the mouth,* followed by an increased flow of saliva, in which the solids are increased proportion-

ately. *In the stomach* vascularity, secretion, and motility are increased, and digestion is favored. Proportionately as the concentration of the alcohol increases, so is digestion hindered, through coagulation of proteids, the precipitation of pepsin, and other chemical reactions inhibitive of gastric assimilation.

The *continued use* of alcohol causes chronic hyperæmia of the stomach, with increased secretion of mucus, atrophy of peptic gland cells; in short, the chronic gastric catarrh of drunkards. There is, later, also an increase of the connective tissue of various organs, especially the liver and kidneys, as well as a fatty degeneration of the heart, blood-vessels, and other organs. Alcohol is *rapidly absorbed* from the stomach and intestines, and the greater part is oxidized in the body, preventing to a certain extent the combustion of fats and carbohydrates, but it does not seem to decrease nitrogenous waste.

After a small amount is taken into the body (and this differs widely in different individuals) *temperature* is slightly increased, as is also *respiration*. The number and force of the *heart* beats are increased and *blood pressure* is raised. The *skin* is reddened and there is a general feeling of warmth. Thought, speech, action, and motion are increased, as a rule, which is thought by some to be due to stimulation of the cells of the nervous system, and by others to removal of restraining influences which govern these. If the quantity be large enough, the picture is one of *ordinary alcoholic intoxication*.

Alcohol is **eliminated** chiefly by the *lungs*, *kidneys*, and *skin*.

**Toxicology.** I. *Acute Fatal Alcoholism.*—Very *large* or *toxic doses*, after a brief period of excitement, which may or may not be present, depress the cerebrum and the spinal reflex centres, affecting finally the medulla, causing death by *paralysis of the respiratory centre*.

The **treatment of acute alcoholic poisoning** consists in the use of *emetics* or *lavage*, the administration of a *diffusible*

*stimulant*, like *ammonia*, or a *slower stimulant*, one like *strychnine* or *caffeine* or *black coffee*. The extremities should be kept warm, and, if sleeplessness be present, chloral in small amounts may be administered.

II. *Chronic Alcoholism.*—Usually it is marked by *chronic gastric catarrh, anorexia, emaciation, restlessness*, and *insomnia*. There are *tremors* of the hands and tongue, particularly the latter. There are *disorders of sight* and *hearing*, and *mental depression*. The *pulse* is soft and weak; the extremities are cold. With discontinuance of the drug, these symptoms subside; or they are followed by the condition known as *delirium tremens*, in which there is an active delirium, with mania and hallucinations of a terrifying character. The muscles are in a constant tremor, the patient talks incoherently, and insomnia is continuous. The patient may pass into coma, which precedes death, or he may expire suddenly from collapse. The coma of alcohol resembles that of opium, cerebral concussion, or hemorrhage, and these conditions are difficult to differentiate.

**Treatment of Chronic Alcoholism.**—The drug should be gradually withdrawn; quiet and sleep are imperative, chloral and bromides with digitalis, or strychnine with gastric sedatives, as bismuth, are all indicated.

**Uses.**—1. *Externally* in dilute solution for the purpose of toughening the skin in threatened *beb-sores*, etc. It is also used as an antiseptic.

2. *Internally*, in *shock, hemorrhage, sudden depression of the heart*, it is of great value. In *chills* with threatened fever, whiskey or brandy are indicated. They are also used in *typhoid, pneumonia, capillary bronchitis*, and in *smallpox*. In *pyæmia, septicæmia*, and *diphtheria* it is highly praised.

Alcohol is **contraindicated** in *nephritis* or *acute diseases* of the genitourinary tract.

## ALOE (ALOES).

**Source.**—The *inspissated juice of the leaves of Aloe vera, Aloe chinensis,* and *Aloe perryi,* and other species of aloes.

**Form.**—Hard masses, as a rule; yellowish-brown or orange-brown in color, with a saffron-like odor and a bitter taste.

**Solubility.**—It yields its active matter to cold water, and is entirely soluble in alcohol. It contains a **neutral principle,** *aloin,* which represents the activity of the drug.

## ALOINUM (ALOIN).

Aloin differs slightly, according to the variety of aloes from which it is obtained. The usual source is Curaçao aloes, and is soluble in 65 parts of cold water, freely in boiling water, and stays in solution on cooling, and is soluble in 10.75 parts of alcohol at 25° C.

**Form.**—Minute acicular crystals; color from yellow to yellowish-brown; odorless, or a slight aloes odor, with a characteristic bitter taste; is permanent.

**Dose.**—$\frac{1}{2}$ to 2 gr. (0.03 to 0.12 gm.).

**Action.**—Aloes is classed with the purges, its seat of action being confined to the large bowel, in which it increases secretion and peristalsis. It also augments the amount of blood in the abdominal and pelvic viscera. It is used in habitual constipation, in which there is torpor of the large intestine.

Aloes is **used** in *amenorrhœa,* either alone or in combination with myrrh; in *menorrhagia,* in combination with iron, when the condition is due to debility. The same combination is also advisable in *chlorosis.*

Aloes is also used in *combination with many other agents,* all of which have an action of their own, and which suggest themselves as adjuvants to aloes.

### The Official Preparations of Aloes.

**Aloe Purificata** (**Purified Aloes**).—Made by dissolving aloes in alcohol, straining, and evaporating. **Dose,** same as aloes—½ to 10 gr. (0.03 to 0.60 gm.).

**Extractum Aloes** (**Extract of Aloes**).—**Dose,** ½ to 3 gr. (0.03 to 0.20 gm.).

**Pilulæ Aloes** (**Pills of Aloes**).—Each contains 0.13 gm. of aloes. **Dose,** 1 to 4 pills.

**Pilulæ Aloes et Ferri** (**Pills of Aloes and Iron**).—Each pill contains 0.07 gm. (1 gr.) each of aloes and dried ferrous sulphate. **Dose,** 1 to 4 pills.

**Pilulæ Aloes et Mastiches** (**Pills of Aloes and Mastiche**).—Each pill contains about 0.13 gm., with 0.04 gm. mastiche and 0.03 gm. red rose. **Dose,** 1 to 3 pills.

**Pilulæ Aloes et Myrrhæ** (**Pills of Aloes and Myrrh**).—Each pill contains about 0.13 gm. of aloes, with 0.06 gm. myrrh and 0.04 gm. aromatic powder. **Dose,** 1 to 3 pills.

**Tincturæ Aloes** (**Tincture of Aloes**).—10 per cent. in strength. **Dose,** ℥¼ to ℥1 (1 to 4 c.c.).

**Tincturæ Aloes et Myrrhæ** (**Tincture of Aloes and Myrrh**).—Contains 10 per cent. each. **Dose,** ℥1 to ℥2½ (4 to 10 c.c.).

## ALUMEN (ALUM, POTASSIUM ALUM).

**Source.**—Is *aluminum* and *potassium sulphate*—*i. e.*, $K_2Al_2(SO_4)_4+24H_2O$.

**Form.**—Large, colorless, octahedral crystals, sometimes cubes or fragments, of a strongly astringent, sweetish taste; odorless and of acid reaction.

**Solubility.**—In 9 parts of *cold water*, freely in *boiling water*, in warm glycerin, but insoluble in *alcohol*.

**Dose.**—5 to 30 gr. (0.30 to 2 gm.).

**The Official Preparations of Alum.**

**Alumen Exsiccatum** (**Dried Alum**).—Alum from which 24 molecules of water of crystallization have been driven off. It is a white granular powder, odorless; a characteristic astringent, sweetish taste, and attracts water from the air. It is slowly **soluble** in 20 parts of cold water. **Used** externally chiefly.

**Alumini Hydroxidum** (**Aluminum Hydroxide**).—A white, light, amorphous powder; tasteless; odorless; insoluble in water and alcohol; soluble in hydrochloric acid, sulphuric acid, and fixed alkalies.

Used as an external astringent.

**Alumini Sulphas** (**Aluminum Sulphate**).—A white, crystalline powder; odorless, with a sweetish, astringent taste. Soluble in water, not in alcohol. Used as an antiseptic and astringent. Both hydroxide and sulphate are **incompatible** with *tannin; soluble* in *lead salts* and *alkalies.*

**Action.**—*Externally,* applied to an abraded surface, alum coagulates the albumin of the tissues, the contracture closing small vessels and checking hemorrhage; applied to unbroken skin, it toughens and thickens it.

*Internally,* in the *mouth,* it excites the salivary glands to secretion; in the *stomach,* even in dilute solution, it checks secretion, precipitates pepsin, and interferes with digestion. In large quantities it is a violent gastric irritant. It acts as an emetic in large doses (4 to 8 gm.) by local irritation, but it is uncertain. Its action on the *blood* and *nervous system* is disputed. Doubt is expressed by many as to whether it enters the circulation at all.

**Uses.**—Locally it is used extensively as an application to *exuberant granulations,* and also to check *hemorrhages* from the *rectum, bladder,* and *vagina.* It is exceedingly valuable in *hæmoptysis.* It is employed in *sweating,* either of a local or general type. It may be used topically in

*epistaxis, pharyngitis, tonsillitis, relaxation* of the *uvula, swollen gums,* and *ptyalism.*

**Disadvantages.**—One should always bear in mind that alum is exceedingly destructive to the enamel of the teeth.

## AMMONIA.

**Aqua Ammoniæ.**—An *aqueous* solution of ammonia gas ($NH_3$), 10 per cent. being present; is a colorless liquid, with a pungent odor, acid taste, and strongly alkaline.

**Dose.**—10 to 20 ♏ (0.60 to 1.20 c.c.), well diluted.

**Aqua Ammoniæ Fortior (Stronger Water of Ammonia).**—Contains 28 per cent. of gas, and is not used internally.

**Spiritus Ammoniæ (Spirit of Ammonia).**—An *alcoholic* solution containing 10 per cent. of ammonia gas.

**Dose.**—10 to 60 ♏ (0.60 to 4 c.c.), well diluted.

**Spiritus Ammoniæ Aromaticus (Aromatic Spirit of Ammonia).**—Contains ammonium carbonate, aqua ammoniæ, the oils of lemon, lavender, and nutmeg, alcohol, and water.

**Dose** and **uses** are the same as spiritus ammoniæ.

**Linimentum Ammoniæ (Liniment of Ammonia).**—Contains aqua ammoniæ, cotton-seed oil, and alcohol.

## AMMONIUM.

**Source.**—A chemical radicle which does not exist in a free state. It unites with acids to form salts.

**Liquor Ammonii Acetatis (Solution of Ammonium Acetate, Spirit of Mindererus).**—**Prepared** by neutralizing dilute acetic acid with ammonium carbonate, and **contains** about 7 per cent. of the acetate, with small amounts of acetic and carbonic acids.

**Dose.**—℥2 to ℥1 (8 to 30 c.c.). **Used** as a *diaphoretic* in *fevers.*

**Ammonii Benzoas.**—See under Benzoin.

**Ammonii Bromidum.**—See under Bromine.

**Ammonii Carbonas** (**Ammonium Carbonate**).—Consists of white masses composed of the acid ammonium carbonate and ammonium carbamate.

**Dose.**—2 to 15 gr. (0.10 to 1 gm.).

**Ammonii Chloridum** (**Chloride of Ammonium**).—A white, crystalline powder with a saline taste, a feebly acid reaction and freely **soluble** in water, sparingly in alcohol.

**Dose.**—1 to 30 gr. (0.06 to 2 gm.). There is a troche official; each troche contains $1\frac{1}{2}$ gr. (0.10 gm.).

**Ammonii Iodidum.**—See under Iodine.

**Ammonii Valeras.**—See under Valerian.

**Action.**—*Externally*, in its *local* action, ammonia is *irritant* or *escharotic*, the severity of its action depending on the concentration of the solution applied, and whether or not its vapor is confined.

*Internally. Nervous System.*—On the cerebrum it has no action. Small doses stimulate the various centres in the medulla. Toxic doses produce convulsions which are due to spinal motor activity.

*Respiration.*—The respiratory centre is stimulated directly and respirations are increased. Toxic doses stimulate, then paralyze the respiratory centre.

*Circulation.*—Blood pressure is raised, due either to centric vasomotor stimulation or stimulation of peripheral arterioles directly, while its effect on the heart is various. The heart is either slowed, due to vagal stimulation; or accelerated, which may be due to a stimulation of cardiac accelerators, or to stimulation of the muscle itself. Toxic doses first stimulate, then depress the entire circulatory apparatus.

**Absorption and Elimination.**—*Ammonia* is rapidly absorbed and oxidized in the tissues to uric acid and urea, and is eliminated by the kidneys as such, the acidity of the urine being increased. *Ammonium carbonate* and *acetate* are excreted as urea.

*Ammonium chloride* is absorbed as such, and in large doses is very apt to cause nausea and vomiting. It is eliminated unchanged.

**Toxicology.** *Symptoms.*—Ammonia, when inhaled, produces various degrees of irritation in the respiratory tract, all depending on the length of exposure and concentration of the vapor. It may cause death by œdema of the glottis, or it may cause a severe bronchitis or an irritation pneumonia. *Internally,* it acts as a corrosive poison, causing severe gastroenteritis, with cardiac depression, dyspnœa, etc.

**Treatment.**—When *inhaled,* fresh air and demulcent sprays may allay the irritation.

*Internally.*—Neutralize the alkali with vegetable acids, emesis, stimulation, and demulcent drinks.

**After-treatment.**—The symptoms require care according to the conditions present.

**Uses.** *Externally.*—As a *counterirritant* either the water or liniment is used in *joint affections* and *chronic rheumatism.* The water is also used as a *rubefacient* and *vesicant.* It is very efficient, but must be applied with caution as an inhalation in *syncope.*

The spirit and aromatic spirit are very good as rapidly acting *circulatory stimulants* in sudden threatened *cardiac failure* from any cause. They are also used in *nervous headache* and *alcoholism.*

The carbonate is extensively prescribed as a *stimulating expectorant* in *bronchitis,* in *pneumonia* and *bronchopneumonia;* also in *delirium tremens* and *fevers.* Ammonium chloride is ordered as an expectorant in *chronic bronchitis* and *bronchorrhœa,* and is also used in *gastric* and *intestinal catarrhs,* in all of which it is said to stimulate the glands, increasing their secretions and rendering them more liquid. It is also exhibited in *enlarged lymphatic glands,* being administered internally, as well as applied in the form of an ointment.

It is given in *rheumatism, myalgia, albuminoid infiltration*

of the *kidneys* and *liver*. It is also used in *functional amenorrhœa*, in *nervous headache, migraine*, and *neuralgia*. In *hepatic disorders*, as early *cirrhosis, hepatic torpor, duodenal catarrh*, and *jaundice*, it is very serviceable.

Ammonium acetate is used in *continued fevers* as a *diaphoretic*. It acts in this manner if the skin be warm, but if not it is *diuretic*. The preparation generally used is the *liquor ammonii acetatis*.

## AMYLIS NITRIS (AMYL NITRITE).

**Composition.**—A liquid containing about 80 per cent. of *amyl* (chiefly *iso-amyl*) *nitrite*.

**Source.**—By oxidizing *amyl alcohol* with nitric acid.

**Form.**—A colorless, oily, volatile liquid, inflammable, with an ethereal, fruity odor and an aromatic, pungent taste. It is **insoluble** in water, but **soluble** in alcohol and ether in all proportions.

**Reaction.**—Neutral or slightly acid.

**Dose.**—1 to 3 ♏ (0.06 to 0.20 c.c.) by inhalation.

**Symptoms.**—After *inhalation of medicinal amounts* there is felt at once a sense of fulness and throbbing in the head; the face and neck are flushed; respirations are deeper and quicker. There may be confusion, giddiness, and, at times, headache. The condition is transient.

In *toxic doses* there may be muscular relaxation, with respirations slow and irregular; the pulse is slow and weak. Stupor and convulsions may follow.

**Action.** *Nervous System.*—The cerebrum and cord are unaffected by medicinal doses. The throbbing and fulness in the head are due to a dilatation of the vessels in the brain. The convulsions seen in toxic doses are cerebral in origin, due either to a direct action on the cells or to an anæmia of the brain. The respiratory centre is stimulated by small doses and depressed by toxic doses, death being the result of this depression.

*Circulation.*—It induces at once a great fall in blood pressure, due to a depression of the muscular coats of the arterioles; the pulse is accelerated, possibly due to a depression of the vagus centre in the medulla, although the lessened peripheral resistance may be a factor. Large amounts depress the heart muscle.

The *temperature* is lowered somewhat, but is due to dilatation of skin vessels.

**Uses.**—In all conditions where blood pressure is high, as in *chronic nephritis, puerperal eclampsia* before parturition, *angina pectoris.* It is used in *asthma* of *cardiac* or *uræmic* types; in continued *epileptic convulsions;* in *arteriosclerosis,* with a degenerated or enlarged heart. It is used in *hiccough* as an antispasmodic.

## NITROGLYCERIN (PROPENYL TRINITRITE, GLONOIN, TRINITRIN).

**Properties.**—A clear, oily, heavy liquid, non-volatile, with a sweet taste, odorless. It is **insoluble** in *water;* **soluble** in *alcohol, ether,* and *oils.*

**Dose.**—$\frac{1}{200}$ to $\frac{1}{50}$ gr. (0.0003 to 0.0013 c.c.) or more.

### The Official Preparations.

**Spiritus Glycerylis Nitratis (Spirit of Glyceryl Trinitrate, Spirit of Nitroglycerin).**—An alcoholic solution containing 1 per cent.

**Dose.**—1 to 3 ♏ (0.06 to 0.20 c.c.).

## SODII NITRIS (SODIUM NITRITE).

**Properties.**—A white, crystalline powder, or opaque masses, deliquescent in air, gradually oxidizing to sodium nitrate; is odorless, has a saline taste, and is freely soluble in water.

**Dose.**—½ to 3 gr. (0.03 to 18 gm.).

**Action.**—The action of nitroglycerin and sodium are similar to that of amyl nitrite. Nitroglycerin acts less promptly and its effects are more lasting.

Sodium nitrite and also potassium nitrite are very much slower in their action, but their effects are more lasting than those of nitroglycerin.

**Uses** are the same, but rather in those conditions where a more enduring action is desired.

## SPIRITUS ÆTHERIS NITROSI (SPIRIT OF NITROUS ETHER)

**Composition.**—An alcoholic solution of ethyl nitrite, yielding when freshly prepared and tested, 4 per cent. of ethyl nitrite.

**Properties.**—A clear, mobile, volatile, inflammable liquid of pale, yellowish or faintly greenish-yellow tint, having a fragrant, ethereal, and pungent non-acrid odor, and a sharp, burning taste.

**Dose.**—Fl℥ j to ij (2 to 8 c.c.).

**Action and Uses.**—It combines the effects of ether and the nitrites; it is a diffusible stimulant, antispasmodic and stomachic. It is diaphoretic (*if the skin be kept warm*); larger doses are diuretic (*if the skin be kept cool*). Excessive doses produce the same symptoms as do other nitrites. As a diuretic it acts by dilating the renal vessels; as a diaphoretic, by dilating the cutaneous vessels; each, after the manner of the nitrites. Its antispasmodic effects are due to the ether. Much of the spirit of nitrous ether on the market contains but little nitrite, and its value, if any, depends on its contained ether. It is much used as a *diaphoretic* in the *febrile complaints* of children, also as a *diuretic* and *antispasmodic*.

## ANISUM (ANISE).

**Source.**—The fruit of *Pimpinella anisum.* Habitat, Europe. The chief constituent of anise-seed, is a volatile oil, composed chiefly of *anethol.*

Anise and its oil are much used as *antispasmodics;* are of value also in *liquefying bronchial secretions.* They are much used in the *flatulence* of children.

## ANTIMONIUM (ANTIMONY. STIBIUM).

Practically the only salt of antimony enjoying any medicinal use at the present time is:

**Antimonii et Potassii Tartras (Tartrate of Antimony and Potassium, Tartar Emetic).**—Other salts of antimony formerly enjoyed extensive use. Tartar emetic is being gradually displaced by other agents less depressing and less dangerous.

### Antimonii et Potassii Tartras (Tartar Emetic).

**Properties.**—This salt exists as colorless, transparent crystals, becoming opaque and white on exposure to air, or as a white, granular powder. Both are odorless and have a sweet, afterward disagreeable, metallic taste. **Soluble** in 15.5 parts of water at 25° C., 3 parts boiling water; **insoluble** in alcohol.

**Dose.**—*As an expectorant,* $\frac{1}{10}$ to $\frac{1}{2}$ gr. (0.006 to 0.03 gm.); *as an emetic,* 1 to 2 gr. (0.06 to 0.12 gm.).

#### The Official Preparations of Antimony.

**Vinum Antimonii (Wine of Antimony).**—Contains 0.4 per cent. of tartar emetic.

**Dose.**—*As an expectorant*, 5 to 60 ♏ (0.30 to 4 c.c.); *as an emetic*, fℨ j to iv (4 to 15 c.c.).

**Syrupus Scillæ Compositus** (**Compound Syrup of Squills, Hive Syrup**).—Contains in 100 c.c. 0.20 gm. of tartar emetic. (See Squills.)

**Action.**—*Systematically* the action of antimony resembles that of arsenic in almost every detail, except in that it is more irritating to the stomach and intestines. It produces the same lesions in the intestinal tract, and its toxicology is the same in almost every detail. The use of tartar emetic as an emetic is accompanied by considerable depression; absorbed into the circulation it slows and weakens the cardiac contractions, due to direct effect on the muscle itself. *Locally* antimony is very irritating, and its application leads to a pustular eruption which resembles that of smallpox quite closely.

**Uses.**—The uses of tartar emetic are becoming more and more limited. It is used as an *emetic* occasionally, but is too slow. Also in acute inflammations as *bronchitis, laryngitis, pleuritis*, etc. It may be used as a *diaphoretic* in *febrile* conditions. The compound syrup of squills is used as an *expectorant.*

**Toxicology.**—Although the drug is but seldom used by physicians, nevertheless the indiscriminate use of "hive syrup" by the laity occasions frequently the prompt use of antidotes.

The stomach should be washed out repeatedly, for the drug is eliminated by the intestinal tract. Rapidly acting cathartics are indicated also. The **chemical antidote** is *tannic acid*, and this should be added to the water which is used to wash out the stomach. *Opium* is indicated for pain, as are also *stimulants*, to overcome the depression. *Demulcent drinks* are to be used later to overcome the irritation.

## AQUA HYDROGENII DIOXIDI (SOLUTION OF HYDROGEN DIOXIDE; PEROXIDE OF HYDROGEN, $H_2O_2$).

**Composition.**—A slightly acid solution of $H_2O_2$ containing, *when freshly prepared,* about 3 per cent. by weight of absolute hydrogen dioxide, corresponding to about 10 volumes of available oxygen.

**Properties.**—It is a colorless, odorless, limpid liquid, with a slightly acid taste. *Is liable to deteriorate with age, on exposure to heat, or prolonged agitation.*

**Action.**—Its action depends on the readiness with which it parts with its oxygen. When brought into contact with mucus or mucous membranes, blood, pus, or denuded surfaces, active effervescence ensues. Cells of all kinds are broken down in the oxidation process.

**Uses.**—It is an *active germicide* and *antiseptic.* As such it may be used to cleanse *putrid cavities, abscesses, infected wounds,* etc., of all kinds. It is non-toxic and may be used in full strength without causing appreciable local deterioration of the tissues. It is very prompt in its action and yields best results when the cavity is first washed out with some mild solvent.

## ARGENTUM (SILVER).

### The Official Preparations of Silver.

**Argenti Nitras (Silver Nitrate).** **Form.**—Transparent, rhombic crystals, which become gray or grayish-black on exposure to organic matter and light. Is odorless, and has a caustic, metallic taste. Is **soluble** in water and alcohol.

**Dose.**—$\frac{1}{4}$ to 1 gr. (0.015 to 0.06 gm.).

**Argenti Nitras Fusus (Fused and Moulded Silver Nitrate).**—For external use.

**Argenti Nitras Mitigatus** (**Mitigated Silver Nitrate, Mitigated Caustic**).—**Contains** twice its weight of potassium nitrate. The whole is fused and moulded and is intended for external use.

**Argenti Cyanidum** (**Silver Cyanide**).—Used for the extemporaneous preparation of hydrocyanic acid as stated under that subject. (See p. 69.)

**Argenti Oxidum** (**Silver Oxide**). **Properties.**—Is a heavy, brownish-black powder, odorless, and has a metallic taste. Is but slightly **soluble** in water and **insoluble** in alcohol. It is readily oxidizable on exposure to light or organic substances.

**Dose.**—½ to 2 gr. (0.03 to 0.12 gm.).

**Action.**—*Locally*, silver nitrate *coagulates the albumin* of the tissues; its activity will vary according to the concentration of the solution applied. The argenti nitras fusus is an active *caustic*, although its action is limited by the albuminate formed. Dilute solutions are *astringent*. Wherever applied the white precipitate which forms soon turns black, owing to the reduction of the metal. This slough is always disinfected by the silver salt.

*Internally*, in *small doses*, silver is a general *systemic tonic*, and it increases the secretions of the stomach and bowel.

In **acute poisoning** symptoms of acute gastroenteritis present themselves, with collapse, convulsions, and death from paralysis of the respiratory centre.

In **chronic poisoning**, a condition known as *argyria*, there results a peculiar slaty discoloration of the gums and mucous membranes elsewhere; the skin may be involved also, all due to a deposition of the reduced metal. Accompanying this symptom there are emaciation, albuminuria, mental weakness, loss of co-ordination, convulsions, paralysis, with death as the result of paralysis of the respiratory centre. The kidneys, liver, and heart frequently undergo fatty degeneration.

**Treatment of Poisoning.**—In the *acute form* prompt emesis or stomach lavage with salt water, for salt is the antidote; milk is very efficacious, as it forms the insoluble albuminate. Demulcent drinks are to be given later to soothe irritated surfaces.

In *chronic poisoning* the drug of course must be withdrawn and the condition treated symptomatically. Potassium iodide may be used to remove the metal from the tissues. It is not very successful at best. There are no agents which will remove the metal without fail. It may be mentioned that the discoloration which generally precedes other symptoms of the intoxication should be a sufficient warning to withdraw the drug, for if seen early enough the condition need not be necessarily fatal. The discoloration is usually more or less permanent.

**Uses.**—*As an astringent* the nitrate is used in *pharyngitis, laryngitis, conjunctivitis,* and *urethritis* to overcome relaxation as well as for its antiseptic effect. *As a caustic* the *stick* in either form is used in *ulcers* of all kinds which require superficial corrosion only. *Internally* it is used in *chronic gastritis, gastric ulcer, dysentery, chronic enteritis,* and *colitis.* In *locomotor ataxia* it enjoys considerable reputation.

## ARSENUM (ARSENIC).

The metal arsenic, as such, is not used in medicine. The compounds are:

**Arseni Trioxidum (Arsenic Trixoide, Arsenous Acid, White Arsenic).**—This is the substance commonly called arsenic.

**Properties.**—It is a heavy solid, occurring as a powder or in irregular masses. It occurs in **two forms**: one, **amorphous**, transparent, and colorless like glass, and the other, **crystalline**, opaque, or white, like porcelain. Contact with moist air changes the glassy into the white, opaque variety. Both are

odorless and tasteless, slowly **soluble** in *water*, slightly in *alcohol*, and freely in *glycerin*. They are freely soluble in *hydrochloric acid*, *alkaline hydrates*, and *carbonates*.

**Dose.**—$\frac{1}{60}$ to $\frac{1}{20}$ gr. (0.001 to 0.003 gm.).

### The Official Preparations of Arsenic.

**Liquor Acidi Arsenosi** (**Solution of Arsenous Acid**).—Contains 1 per cent. of the trioxide.

**Dose.**—1 to 10 ♏ (0.06 to 0.60 c.c.) *well diluted.*

**Liquor Potassii Arsenitis** (**Solution of Potassium Arsenite, Fowler's Solution**).—Contains 1 per cent. of arsenous acid.

**Dose.**—The same as the foregoing.

**Arseni Iodidum** (**Arsenic Iodide**).—It is in the form of glossy, orange-red, crystalline masses, or shining, crystalline, orange-red scales, having an iodine-like odor and taste. It is **soluble** in *water* and *alcohol*. It gradually loses its iodine on exposure to air and light.

**Dose.**—$\frac{1}{30}$ to $\frac{1}{8}$ gr. (0.002 to 0.008 gm.).

**Liquor Arseni et Hydrargyri Iodidi** (**Solution of Arsenic and Mercuric Iodides, Donovan's Solution**).—It **contains** 1 per cent. each of arsenic iodide and of mercuric iodide. It is a clear, pale yellowish liquid, odorless, and having a disagreeable metallic taste.

**Dose.**—1 to 10 ♏ (0.06 to 0.60 c.c.).

**Sodii Arsenas** (**Sodium Arsenate**). **Form.**—Colorless, transparent crystals, odorless, and having a mild, alkaline taste. It is **soluble** in *water* and *alcohol*.

**Dose.**—$\frac{1}{60}$ to $\frac{1}{10}$ gr. (0.001 to 0.006 gm.).

**Liquor Sodii Arsenatis** (**Solution of Sodium Arsenate, Pearson's Solution**).—It contains 1 per cent. of sodium arsenate.

**Dose.**—1 to 10 ♏ (0.06 to 0.60 c.c.).

**External Action.**—Applied in substance or solution for any length of time, arsenic is an escharotic, exciting much pain and inflammation, and finally sloughing.

**Internal Action.**—*Small doses* increase the *gastric* and *intestinal secretions* as well as peristalsis. *Larger* doses cause gastroenteritis and the mucous membrane undergoes fatty degeneration, as does also that of the pulmonary alveoli, the renal epithelium, and the liver.

The *respirations* are slightly increased, the *heart* is quickened somewhat, and *blood pressure* rises. *Still larger doses* weaken and slow the heart, which becomes arrhythmic, and blood pressure falls, partly due to lessened heart action, and to paralysis of the ends of the splanchnic nerves, which causes a dilatation of abdominal capillaries. This latter action causes among other things congestion of stomach and intestines with the formation of ecchymoses, which at times results in bloody vomiting and bloody diarrhœa.

Arsenic is *absorbed* but its *action on the blood* is obscure; in certain cases of pernicious anæmia it increases the number of newly formed red blood corpuscles. Medicinal amounts are said to heighten *cerebral functions*, but no appreciable effects are discernible in acute poisoning. In chronic poisoning the commonest symptoms are those of peripheral neuritis. Paralysis of muscles of the limbs is occasionally seen, affecting the extensor muscles chiefly.

Its *action on metabolism* is variable; its beneficial effects seen in the various cachexias is apparently dependent upon capillary dilatation and the increased nutrition of parts, with the possibility of some effect of the arsenic itself on the tissue cells.

Arsenic is slowly *eliminated by all channels.* It is stored up in all organs, but seems to be deposited in largest amounts in the liver, kidneys and spleen, while smaller amounts are deposited in the nervous tissues and muscles.

**Acute Poisoning.**—This is marked by symptoms which appear in from a half to one hour and are those of *gastro-*

*enteritis*, as vomiting, diarrhœa with colicky pains, great thirst with dryness of the mouth and throat. The *urine* is diminished and may be bloody (acute nephritis). *Purging* is incessant and the passages have the appearance of *rice-water*, characteristic of cholera, from which it is difficult to distinguish save by chemical or bacteriological tests. There are *headache, vertigo, pain in the limbs, cyanosis*, followed at times by *coma* or *convulsions*, which precede death.

**Treatment of Acute Poisoning.**—*Emesis;* the *antidote* is the hydrated oxide of iron with magnesia which may be used *ad libitum*, and if vomiting should cease the resulting insoluble compound should be removed by *gastric lavage. Stimulants* are indicated and external heat. *Demulcents* are indicated to soothe the inflamed intestinal tract.

**Chronic poisoning** is usually the result of prolonged administration or of exposure to its influence in the arts. The *first symptom* which shows itself is *œdema* of the *eyelids* or even the face. There is *anorexia* due to chronic gastric catarrh, *nausea, vomiting, mild diarrhœa with abdominal pains. Peripheral neuritis* and *paralyses* of muscles of the limbs, *disturbance of sensation* and of *special senses.* There may be *conjunctivitis, rhinitis*, and *skin eruptions.*

Its **treatment** consists in the cessation of the drug, with management of such symptoms as the case indicates.

**External Uses.**—For the removal of *cancer* and other *morbid growths*, applied in solution, or as a paste (equal parts of arsenic and acacia); also for *destroying nerves* in decayed teeth.

**Internal Uses.**—It is prescribed in *anæmia* and *chlorosis*, in *persistent malaria*, and in *chronic rheumatism.* It is also used in skin diseases on which it has a peculiar effect when given internally; in *chronic squamous eczema* and *psoriasis*, as well as *acne* and *pemphigus.* It is used in *asthma, bronchitis* and *emphysema.* It should be tried in *neuralgia, chorea*, and *paralysis agitans.* It is highly recommended in *diabetes.*

## ASAFŒTIDA (ASAFŒTIDA).

**Source.**—A *gum-resin* obtained from the root of *Ferula fœtida*, and probably other species of *Ferula*.

**Habitat.**—Persia and Afghanistan.

**Form.**—Irregular masses of a yellowish color in which are embedded whitish tears. It has an alliaceous odor and taste, and 60 per cent. should be soluble in alcohol. Its *principal constituent* is a sulphuretted volatile oil, whose chief constituent is Allyl (Ferulyl) *Sulphide.*

### The Official Preparations of Asafœtida.

**Tinctura Asafœtidæ.**—20 per cent. in strength. **Dose,** $3\frac{1}{2}$ to 3j (2 to 4 c.c.).

**Emulsum Asafœtidæ.**—4 per cent. in strength. **Dose,** $f\mathfrak{Z}\frac{1}{2}$ to $f\mathfrak{Z}$j (15 to 30 c.c.)

**Pilulæ Asafœtidæ.**—Each pill contains three grs. (0.20.).

**Action.**—Asafœtida has the action of volatile oils in general. Its volatile oil is eliminated by every emunctory, and the odor following patients is quite characteristic. It is classed as an antispasmodic, a stimulant to the nervous system.

**Internal Uses.**—It is used as a *carminative.* In the form of an injection it is used in *colic*, in *tympanites.* In *hysteria* and *nervousness* it has some repute. It is used as a stimulating expectorant in chronic bronchitis.

## ASPIDIUM (MALE FERN).

**Source.**—The rhizome of *Dryopteris filix-mas* (*Male Fern*) or of *Dryopteris marginale* (*Marginal Shield Fern*). Habitat: All parts of the world, and the latter in North America.

**Constituents.**—There are present a *volatile oil* and a *resin;* the *active principle* is *filicic acid,* which is believed to be a mixture of several decomposition products such as Aspidinol, Flavaspidic Acid and others.

### The Official Preparations of Aspidium.

Fern itself is very unstable and the crude drug soon deteriorates. The *oleoresin* is the best preparation and is made by percolating the drug with acetone until exhausted and then evaporating the percolate to viscidity. It deposits on standing *filicic acid.* The preparation should be well shaken before using. **Dose,** fl℥$\frac{1}{4}$ to j (1 to 4 c.c.).

**Uses.**—An agent against tape-worm (the *Bothriocephalus* especially). It is an active vermicide and before administering, it is well to diet the patient for at least twenty-four hours and to follow it with an active cathartic *not oleaginous* in nature, because of the fact that filicic acid is soluble in oils. Solution and absorption are not wanted for the agent is needed in the intestinal tract. Large doses cause gastro-enteritis with much depression, collapse, and at times coma with convulsions.

## AURANTIUM (ORANGE).

**Aurantii Amari Cortex (Bitter Orange Peel).** **Source.**—The dried rind of the fruit of *Citrus vulgaris.* The rind **contains** a bitter glucoside *hisperidin,* and a *volatile oil.* The latter is official as:

**Oleum Aurantii Corticis,** and is obtained by expression. It is also contained in:

**Aurantii Dulcis Cortex (Sweet Orange Peel).**—The peel contains only the oil.

### The Official Preparations of Aurantium.

**Fluidextractum Aurantii Amari** (**Fluidextract of Bitter Orange Peel**).—**Dose,** 15 to 30 ♏ (1 to 2 c.c.).

**Tinctura Aurantii Amari** (**Tincture of Bitter Orange Peel**).—**Dose,** fℨss to ij (2 to 8 c.c.).

**Syrupus Aurantii** (**Syrup of Orange**).—Made from sweet orange peel and used as a vehicle.

**Tinctura Aurantii Dulcis** (**Tincture of Sweet Orange Peel**).—**Dose,** fℨss to ij (2 to 8 c.c.).

**Spiritus Aurantii Compositus** (**Compound Spirit of Orange**).—Contains the oils of orange, 20; lemon, 5; coriander, 2; and anise, ½; alcohol to 100 parts, and is used as a vehicle.

**Elixir Aromaticum** (**Aromatic Elixir, Simple Elixir.**)—Contains of the compound spirit of orange, 1.2; purified talc, 1.5; syrup, 37.5; alcohol and distilled water to 100 parts and is used as a flavoring vehicle. **Dose,** fℨj to viij (4 to 30 c.c.) or more.

**Action and Uses.—Bitter orange** is used as a bitter tonic. **Sweet orange** has its application as a flavor. Any action which orange may have is due to the presence of its volatile oil, and this is no different from that of the volatile oils in general, which is hereinafter described.

**Oleum Aurantii Florum** (**Oil of Orange Flowers. Oil of Neroli**) (not official). **Source.**—A volatile oil distilled from the fresh flowers of bitter orange (*Citrus vulgaris*).

### The Official Preparations of Oil of Orange Flowers.

**Aqua Aurantii Florum Fortior** (**Stronger Orange Flower Water**) is water saturated with the volatile oil of fresh flowers.

**Aqua Aurantii Florum (Orange Flower Water).**—Contains 50 per cent. of the stronger water.

**Syrupus Aurantii Florum (Syrup of Orange Flowers).**

**Uses.**—All used as flavoring agents.

## BALSAMUM PERUVIANUM (BALSAM OF PERU).

**Source.**—A balsam obtained from *Toluifera pareira*, a Central American tree.

**Form.**—It is a liquid of syrupy consistence, free from stickiness and stringiness, brownish black in color, with a warm, bitter taste and a vanilla-like, smoky odor. It should not harden on standing. Is insoluble in water, soluble in alcohol, ether, and chloroform. It contains *benzoic* and *cinnamic acids*, with *resins* and a *volatile oil*.

## BALSAMUM TOLUTANUM (BALSAM OF TOLU).

**Source.**—A balsam obtained from *Toluifera balsamum*, a tree of Venezuela and New Granada.

**Form.**—It is a semisolid mass whose consistence varies with temperature; is yellowish brown in color, with a fragrant odor and a sweetish taste. Is nearly **insoluble** in water, **soluble** in alcohol, ether, and chloroform.

Composition same as Balsam of Peru.

### Official Preparations of Balsam of Tolu.

**Syrupus Tolutanæ.**—**Dose**, *ad libitum*.

**Tinctura Tolutanæ.**—**Dose**, 1 to 4 c.c. (15 to 60 ♏).

## BENZOINUM (BENZOIN, GUM BENZOIN).

**Source.**—A balsamic resin obtained from *Styrax benzoin*, a tree of Sumatra and Siam. It exists in the *form* of agglutin-

ated tears, or a brown mottled mass, with a fragrant odor; it is tasteless at first, afterward irritating to the mouth. It is **insoluble** in water, although water dissolves out the contained benzoic acid; is **soluble** in alcohol, ether, and chloroform. It **contains** *benzoic*, *cinnamic*, and *analogous acids*, along with *resins* and *volatile oil*.

**The Official Preparations of Benzoin.**

**Adeps Benzoinatus** (**Benzoinated Lard**).—A vehicle for ointments.

**Tinctura Benzoini.**—**Dose,** ℥ss to j (2 to 4 c.c.).

**Tinctura Benzoini Composita** (**Friars' Balsam**).—**Dose,** ℥ss to ij (2 to 8 c.c.).

## ACIDUM BENZOICUM (BENZOIC ACID).

**Source.**—An organic acid **obtained from** benzoin by sublimation, or **prepared** artificially from naphthalin or toluol. It is **found naturally** in all balsams, also in the urine of herbivora.

**Form.**—White, or yellowish-white, lustrous scales or needles; permanent in air, rather **volatile** in warm air; pure benzoic acid is odorless, or faintly aromatic, and its taste is warm and acid.

**Solubility.**—281 parts of water at 25° C. and 15 parts of boiling water. Freely in glycerin, alcohol, ether, chloroform, oils, and alkaline hydrates.

**Dose.**—5 to 15 grs. (0.30 to 1 gm.).

**The Official Preparations of Benzoic Acid.**

**Ammonii Benzoas**
**Lithii Benzoas**
**Sodii Benzoas**
} **Dose,** 15 to 30 grs. (1 to 2 gm.).

**Action and Uses of Balsam of Peru, Balsam of Tolu, Benzoin, and Benzoic Acid.**—**Balsam of Peru** is useful in *parasitic skin diseases, pruritus* and also as a stimulating dressing for *ulcers* of all kinds, *bed-sores*, etc. It may be used as an expectorant in *chronic bronchitis* and affections of the genito-urinary tract.

**Balsam of Tolu** is chiefly used as an expectorant and vehicle in cough mixtures.

**Benzoin** depends on its contained acids for its activity as an antiseptic, and is chiefly used to prevent decomposition in animal fats, as in the adeps benzoinatus, which contains 2 per cent. of benzoin.

The tincture and the compound tincture of benzoin are much used in *chapped hands, lips, fissured nipples*, etc. The compound tincture is a valuable topical application in *pharyngitis* and *laryngitis* of catarrhal type, chiefly as a hot steam inhalant.

**Benzoic acid and its salts** are among the best agents to neutralize the ammoniacal urine of *cystitis* and *pyelitis*. Their use in rheumatism is of doubtful value.

Benzoic acid is a frequent ingredient in cough mixtures for *chronic bronchitis* and *catarrh of the upper respiratory tract.*

## BELLADONNA (DEADLY NIGHTSHADE).

**Source.**—The leaves and root of *Atropa belladonna*, a perennial plant of Europe and Asia. Cultivated elsewhere. The leaves should yield not less than 0.35 per cent. of mydriatic alkaloids and the root not less than 0.5 per cent. It contains the alkaloids, *atropine, hyoscyamine, hyoscine,* and *belladonnine.*

**The Official Preparations of Belladonna.**

**Extractum Belladonnæ Foliorum** (**Extract of Belladonna Leaves**).—**Dose,** $\frac{1}{8}$ to $\frac{3}{4}$ gr. (0.008 ot 0.048 c.c.).

**Emplastrum Belladonnæ** (**Belladonna Plaster**).—Made from the extract.

**Unguentum Belladonnæ** (**Belladonna Ointment**).—Made from the extract.

**Tinctura Belladonnæ Foliorum** (**Tincture of Belladonna Leaves**).—10 per cent. **Dose,** 5 to 20 ♏ (0.30 to 1.20 c.c.).

**Fluidextractum Belladonnæ Radicis** (**Fluidextract of Belladonna Root**).—**Dose,** 1 to 3 m. (0.06 to 0.18 c.c.).

**Linimentum Belladonnæ** (**Belladonna Liniment**).—Made from the fluidextract of the root and camphor.

## ATROPINA.

**Source.**—*Atropæ belladonna* (*Solonaceæ*) and from other plants of the same family.

**Form.**—White, acicular crystals, odorless, bitter taste, very alkaline in reaction, **soluble** in 450 parts of water at 25° C. Freely in alcohol, ether, and chloroform. Becomes yellowish on exposure to air. **Dose,** $\frac{1}{120}$ to $\frac{1}{40}$ gr. (0.0005 to 0.0016 gm.).

**Atropinæ Sulphas. Form.**—White, crystalline powder, odorless, very bitter, permanent in air, neutral in reaction. **Soluble** in water, alcohol; nearly **insoluble** in ether, slightly in chloroform.

**Dose.**—$\frac{1}{120}$ to $\frac{1}{40}$ gr. (0.0005 to 0.0016 cgm.).

**Homatropinæ Hydrobromidum.**—An artificial alkaloid **obtained from** atropine by a process of saponification. Atropine is resolvable into *tropine* and *tropic acid* by means of alkalies; the combination of *tropin* with *mandelic* (*oxytoluic acid*) results in a new base, *homatropine*, which

with acids forms salts. The hydrobromide is preferred on account of stability.

**Form.**—Is a white crystalline powder, odorless, bitter, **soluble** in 6 parts of cold water, 133 of alcohol. **Used,** as a rule, in 2 per cent. or 4 per cent. solutions, in ophthalmological practice as a mydriatic.

## HYOSCYAMUS (HENBANE).

**Source.**—The leaves and flowering tops of *Hyoscyamus niger*, collected from plants of the second year's growth, and yielding when assayed not less than 0.08 per cent. of mydriatic alkaloids.

**Contains** chiefly *hyoscine* and *hyoscyamine*. The former is a liquid alkaloid; the latter, crystalline.

### The Official Preparations of Hyoscyamus.

**Extractum Hyoscyami (Extract of Hyoscyamus).**—**Dose,** $\frac{1}{2}$ to 2 grs. (0.03 to 0.12 cgm.).

**Fluidextractum Hyoscyami (Fluidextract of Hyoscyamus.**—**Dose,** 5 to 15 ♏ (0.30 to 1 c.c.).

**Tinctura Hyoscyami (Tincture of Hyoscyamus).**—15 per cent. **Dose,** ℥j to ℥ss (4 to 15 c.c.).

**Hyoscyaminæ Hydrobromidum (Hydrobromate of Hyoscyamine).**—**Dose,** $\frac{1}{60}$ to $\frac{1}{30}$ gr.(0.001 to 0.002 mgm.).

**Hyoscyaminæ Sulphas (Sulphate of Hyoscyamine.**—**Dose,** $\frac{1}{150}$ to $\frac{1}{60}$ gr. (0.0004 to 0.001 mgm.).

**Hyoscinæ Hydrobromidum (Hydrobromate of Hyoscine).**—**Dose,** $\frac{1}{150}$ to $\frac{1}{60}$ gr. (0.0004 to 0.001 mgm.).

## SCOPOLA.

**Scopola (Scopola). Source.**—The dried rhizome of *Scopola carniolica* (*Solonaceæ*), yielding when assayed not less than 0.5 per cent. of mydriatic alkaloids.

Its constituents are those of belladonna, excepting that its chief alkaloid is named scopolamine and differs but slightly from atropine. It is composed of trophic acid and scopoline.

### The Official Preparations of Scopola.

**Extractum Scopolæ.**—**Dose,** $\frac{1}{8}$ to $\frac{3}{4}$ gr. (0.008 to 0.048 gm.).

**Fluidextractum Scopolæ.**—**Dose,** 1 to 3 ♏ (0.06 to 0.18 c.c.).

**Scopolaminæ Hydrobromidum** is the official salt of the alkaloid scopolamine. **Dose,** $\frac{1}{150}$ to $\frac{1}{60}$ gr. (0.0004 to 0.001 cgm.).

## STRAMONIUM (THORNAPPLE).

**Source.**—The dried leaves of *Datura stramonium,* an annual plant of Southern Russia, cultivated elsewhere. It **contains** an alkaloid, *daturine.*

### The Official Preparations of Stramonium.

**Extractum Stramonii (Extract of Stramonium).**—**Dose,** $\frac{1}{6}$ to $\frac{1}{2}$ gr. (0.01 to 0.03 gm.).

**Fluidextractum Stramonii (Fluidextract of Stramonium).**—**Dose,** 1 to 3 ♏ (0.06 to 0.20 cgm.).

**Tinctura Stramonii (Tincture of Stramonium).**—10 per cent. **Dose,** 5 to 60 ♏ (0.60 to 4 c.c.).

**Unguentum Stramonii (Stramonium Ointment).**—Made from the extract.

The alkaloids atropine, hyoscyamine, hyoscine, and daturine are found associated together in varying proportions in all three drugs under discussion. They are isomeric with each other and are converted one into the other quite

readily during process of extraction. Atropine contains varying amounts of hyoscyamine.

**Symptoms of Belladonna Poisoning.**—The earliest sign of the action of belladonna is *dryness of the mouth and throat*, perceptible even after a *small dose*.

With *larger doses* there is the same dryness, with *thirst*, *difficult swallowing*, *dilated pupils*, and *disordered vision*.

The *respirations* and *pulse* are quickened, the face, neck, and sometimes the whole body are covered with an *erythema resembling scarlatina*, but differing in that it is not punctate, is transient and, as a rule, does not desquamate. There may be *dizziness* and *mental confusion*. *Toxic doses* cause the same but more severe symptoms. The patient *cannot swallow*, *thirst is intense*, *speech* is difficult; the *pupils* are widely dilated and do not react to light; there are *excitement*, *restlessness*, the patient is talkative, may suffer *delirium* or *mania*. *Convulsions* may follow and may persist, but usually *stupor* and *coma* follow, the *respirations* and *circulation* become very slow, and *death* is the result of paralysis of the respiratory centre.

**Action.** *Nervous System.*—On the *central nervous system* belladonna confines itself to the *cerebral cortex*, which is first stimulated, then depressed. (There is little action on the *cord.*)

*Secretions.*—Its action on *peripheral secretory nerves* is manifest by a paralysis and consequent checking of almost all secretions, as the *saliva*, *milk*, *gastric juice*, *the sweat*, *pancreatic juice*, etc.

*Eye.*—Administered internally or locally, the *pupil* is dilated through paralysis of the *terminals of the motor oculi nerve* which control the sphincter in the *iris*. That the sympathetic is stimulated is doubtful. Accommodation is lost and intraocular tension is increased.

Fig. 1

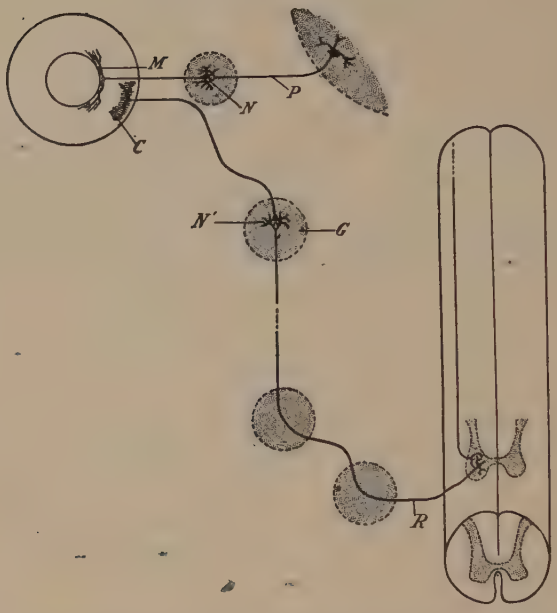
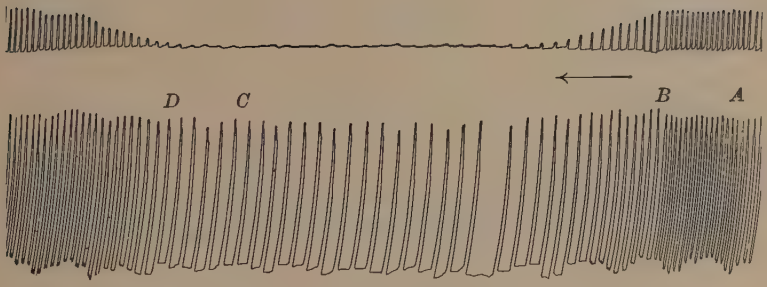



Diagram of the innervation of the iris. *P*, a fibre of the motor oculi passing from the brain to the ciliary ganglion *N*, in which it terminates around a nerve cell, which sends an axis cylinder to terminate (*M*) in the circular fibres of the iris. *R*, a spinal nerve fibre issuing from the lower cervical cord, running through the stellate and inferior cervical ganglia and terminating around a ganglion cell in the superior cervical ganglion *G*. The axis cylinder from this nerve cell runs to the iris (passing the ciliary ganglion) and terminates (*C*) on the radiating fibres. *M*, indicates the terminations of the nerve fibre in the circular fibres, and is the point acted on by atropine and muscarine. *N*, *N'*, the ganglion cells, is the seat of the action of nicotine. *C*, the termination in the dilator fibres, that of cocaine. (Cushny.)

FIG. 2




Tracings of the ventricle (lower) and auricle (upper) of the dog's heart. During systole the levers move upward; during diastole, downward. At *A*, the heart is normal; at *B*, the inhibitory fibres were stimulated electrically, and this was continued throughout the tracing. The ventricular rhythm became slow and irregular, while the auricle stood still in diastole. At *C*, atropine sulphate was injected into a vein, and at *D* the effects of the inhibition began to pass off, although the stimulation was continued. (Cushny.)

*Circulation.*—The *heart* is usually quickened, the result of *paralysis* of the *vagus endings* in the heart. *Blood pressure* is raised, due to increased output and *centric vasoconstrictor stimulation*, although it is stated that the heart itself is slightly stimulated. The heart is *not paralyzed* unless the drug is used in *very* large doses, when it stops in diastole. The *erythema* seen is produced by the *dilatation of cutaneous vessels*, the cause for which may be central or peripheral, as yet not determined.

*Respiration.*—Small doses quicken and deepen, due to *stimulation of the respiratory centre*, while large doses kill by *paralysis* of the same.

*Muscle.*—The movements of almost *all organs* composed of *unstriped* muscle are *lessened*, not so much through action on the muscle itself, but by *paralysis* of *peripheral nerves* supplying the same.

**Uses.**—These three drugs may be used interchangeably, for where one is useful the others are usually also. But each has its own indications in certain cases. Thus **stramonium** seems to be especially indicated in asthmatic conditions of bronchial spasmodic origin. The leaves are used, being burned and the smoke inhaled.

The uses of its alkaloid **Daturine** differ in no way from those of **Atropine.**

**Hyoscyamus and its alkaloids** are used and preferred generally for their more quieting and hypnotic effect on the cerebrum. Hyoscine being preferred in cases of *acute mania, delirium tremens,* etc. Hyoscyamus is also the choice in genitourinary conditions. In spasmodic conditions of involuntary muscle, as in *asthma, laryngismus stridulus,* in *hiccough,* at times in *whooping-cough,* in *spasmodic asthma* from any cause, in *constipation,* in combination with cathartic agents to relieve *spasm* (griping) caused by their action, also in *spasmodic dysmenorrhœa,* also in *urinary incontinence* due to an *irritable bladder,* belladonna, hyoscyamus, or stramonium may be used.

The ointment of belladonna is very useful in *spasm* of the *urethra,* in an *irritable sphincter ani* due to hemorrhoids, etc.

To *check secretions,* used internally or locally, belladonna is without equal in checking *lacteal secretion;* also *ptyalism* from any cause, also in *acute coryza.*

*Eye.*—Atropine and homatropine are used extensively in ophthalmology; 1 per cent. solutions of atropine are used as a rule in *iritis* to break or prevent adhesions, in *phlyctenular keratitis* and in *perforating ulcers.* For purposes of examination homatropine or hyoscine are preferred on account of *the brevity* of their action, the symptoms wearing off in less than twenty-four hours, while accommodation does not become normal after atropine until from five to seven days. Homatropine dilates the pupil in the same way as does atropine; intraocular tension is by no means so great in the former as in the latter.

## BISMUTHUM (BISMUTH).

Bismuth is itself not used in medicine.

### The Official Preparations of Bismuth.

**Bismuthi Subnitras.** **Form.**—A heavy, white, odorless powder, with a faint acid taste and acid reaction. Almost **insoluble** in water and alcohol; **soluble** in nitric and hydrochloric acid without effervescence. Is permanent in air.

**Dose.**—5 to 60 grs. (0.30 to 4 gms.).

**Bismuthi Subcarbonas.** **Form.**—A white or yellowish-white, tasteless and odorless powder, **insoluble** in water and alcohol, **soluble** in nitric and hydrochloric acid with effervescence and permanent in air.

**Dose.**—5 to 30 grs. (0.30 to 4 gm.).

**Bismuthi Subiodidum** (not official). **Form.**—A yellowish-red, light, crystalline powder, **used** locally as a substitute for iodoform as a dressing.

**Action.**—The **subnitrate** and **subcarbonate**, although small amounts are absorbed into the circulation, have no action save that of *local sedation* and *astringency*. Impure salts containing arsenic and lead are apt, when given in large quantities, to produce symptoms characteristic of these substances.

**Internal Uses.**—They are administered in *acute gastritis*, *gastric ulcer*, and *diarrhœa*, both acute and chronic. They act largely by forming a protective coating over the irritated surfaces.

**External Uses.**—They are used as dressings for *wounds stomatitis*, *eczemas*, *ulcers*, and *bromidrosis*. The iodide is used as a dressing in surgery on account of the iodine liberated.

**Bismuthi Citras** (**Bismuth Citrate**).—A white, amorphous or microcrystalline powder, odorless and tasteless, and permanent in air. It is **insoluble** in water and alcohol, but is **soluble** in ammonia water, and in solutions of alkali citrates.

**Dose.**—1 to 5 grs. (0.06 to 0.30 gm.). Seldom used internally. More of pharmacal interest in making the citrate of bismuth and ammonium.

**Bismuthi et Ammonii Citras** (**Bismuth and Ammonium Citrate**).—Shining, pearly, or translucent scales, odorless, having a metallic taste, and becoming opaque with loss of ammonia on exposure to air. It is very **soluble** in water, and sparingly in alcohol.

**Dose.**—1 to 5 grs. (0.06 to 0.30 gm.).

**Bismuthi Subgallas** (**Bismuth Subgallate**).—An amorphous, bright-yellow powder, odorless and tasteless, permanent in air. It is of variable chemical composition. **Insoluble** in water, alcohol, and ether.

**Dose.**—1 to 10 grs. (0.06 to 0.60 gm.).

**Bismuthi Subsalicylas** (**Bismuth Subsalicylate**).—White or nearly white, amorphous or crystalline powder, odorless, tasteless, and permanent in air. It is almost **insoluble** in water.

Bismuth subsalicylate is used to some extent in *typhoid fever*, where it is hoped it has some effect on the bowel condition. It is supposed by some to be slowly decomposed and salicylic acid freed.

**Dose.**—1 to 10 grs. (0.06 to 0.60 gm.).

**Bismuthi et Ammonii Citras** (**Bismuth and Ammonium Citrate**).—It is much more astringent than the subnitrate, and when used in too concentrated a form causes much irritation. It is **used** in *chronic diarrhœa*, and those acute forms of diarrhœa which are accompanied with relaxation. Is also used for local application.

**Dose.**—1 to 3 grs. (0.065 to 0.20).

## BROMUM (BROMINE).

**Form.**—A dark-red liquid with a disagreeable, suffocating odor. Is sparingly **soluble** in water, freely in alcohol and ether. It is little **used** in medicine unless a severe and rapidly acting caustic is required, as in *hospital gangrene*, *epithelioma*, and *carcinoma*.

Internally it is a violent irritant.

### The Official Preparations of Bromine.

**Potassii Bromidum** (**Potassium Bromide**).—**Contains** 66 per cent. of bromine. **Dose**, 15 to 60 grs. (1 to 4 gm.).

**Sodii Bromidum** (**Sodium Bromide**).—**Contains** 78 per cent. of bromine. **Dose**, 15 to 60 grs. (1 to 4 gm.).

**Ammonii Bromidum** (**Ammonium Bromide**).—**Dose**, 15 to 60 grs. (1 to 4 gm.).

**Lithii Bromidum** (**Lithium Bromide**).—**Dose**, 15 to 30 grs. (1 to 2 gm.).

**Calcii Bromidum** (**Calcium Bromide**).—**Dose**, 15 to 30 grs. (1 to 2 gm.).

**Strontii Bromidum** (**Strontium Bromide**).—**Dose**, 15 to 30 grs. (1 to 2 gm.).

**Zinci Bromidum.**—**Dose**, 0.5 to 5 grs. (0.03 to 30 gm.).

The bromides are all in the **form** of colorless granules or crystals, odorless, with a saline, bitter taste. They are **soluble** in water, less so in alcohol. Owing to their irritant action on the stomach they should be given well diluted.

**Acidum Hydrobromicum Dilutum** (**Diluted Hydrobromic Acid**). **Form.**—A liquid composed of 10 per cent. by weight of absolute hydrobromic acid and 90 per cent. of water. It is clear and colorless with an acid taste, and is **miscible** in all proportions of water and alcohol.

**Dose.**—℥ss to ℥j (2 to 4 gm.).

## BROMOFORMUM (BROMOFORM).

**Form.**—A colorless liquid with a sweet taste and an agreeable odor. **Insoluble** in water, **soluble** in alcohol and ether. Contains 99 per cent. of absolute bromoform.

**Dose.**—1 to 5 ♏ (0.06 to 0.30 c.c.).

**Action.**—The action of the bromides largely **depends on** the dissociability of their respective elements in the tissues, which are more or less influenced by the base, aside from the action of the bromine. Their effects being much the same. **Potassium Bromide is taken as a type and the others are compared with it.**

*Nervous System.*—Bromides depress the *cerebral cortex* involving the motor areas and if long continued produce somnolence, and impair the intellect and memory. The *cord*, both *motor* and *sensory tracts*, as well as *peripheral sensory terminations*, are depressed; *reflexes* of all kinds are retarded or abolished.

*Circulation.*—Potassium bromide is the only one which causes a direct depression of the *heart muscle*, this effect being due to the potassium and not to the bromine. *Blood pressure* is lowered. Its effects on *small vessels* are disputed.

*Absorption and Elimination.*—The bromides are rapidly absorbed and may be detected in the urine within a few moments after ingestion. They tend, after continued use, to *accumulate* in the system, and, after treatment is discontinued, are found in the urine for a month or more afterward.

**The Action of the Bromides Compared.—Sodium Bromide** is less depressing to the heart and central nervous system than is the potassium salt.

**Ammonium Bromide** is more stimulating than the others on account of the ammonium base. The others all resemble the potassium salt.

**Symptoms of Chronic Bromide Poisoning.**—After large or continued dosage, certain symptoms arise termed *bromism*,

and are indicated usually by a *dull headache, great somnolence, mental weakness, partial aphasia,* and *muscular weakness.* There is usually a marked *loss* of *sensation* in skin and mucous membrane, with *reflexes* very much lessened. The *sexual function* is abolished. The breath is fetid; usually there is an *acne,* which may be very severe. The symptoms disappear on withdrawing the drug. There are no cases of acute fatal poisoning on record.

**Uses.**—The chief use of the bromides is in *epilepsy;* either one alone or several in combination give excellent results. In *headaches* and *sleeplessness* due to excitement or overwork; in *migraine* and *neuralgias,* in combination with acetanilid and caffeine. As an antispasmodic in *asthma, laryngismus stridulus, chorea, whooping-cough,* and *dysmenorrhœa.* In *convulsions* of all kinds either alone or in combination with chloral. They are useful in *acute articular rheumatism,* the lithium salt being preferred. Also in *chronic alcoholism* and *morphiomania.* In *nymphomania, satyriasis, spermatorrhœa, masturbation,* and *chordee.* Bromides are to be withheld in all *anæmic* conditions. To avoid the *acne rash,* arsenic (Fowler's solution) is given either alone or with them. They are compatible.

**Bromoform** is used in the same manner as are the bromides, but is most largely used in *whooping-cough.*

**Diluted Hydrobromic Acid** is not used to any extent on account of its irritating qualities.

## CAFFEINA (CAFFEINE).

**Source.**—An alkaloid of feebly basic character obtained from *Thea sinensis* and *Caffea arabica.* It is the alkaloid of tea and coffee.

**Form.**—Fleecy masses of long, flexible, white, silky crystals, odorless, taste bitter; permanent in air, soluble in 80 parts of water and 38 parts of alcohol.

### The Official Preparations of Caffeine.

**Caffeina Citrata** (**Citrated Caffeine**).—A mixture of equal parts of caffeine and citric acid; is a white, odorless powder, with an acid taste and soluble in water. **Dose,** 2 to 8 grs. (0.12 to 0.50 gm.).

**Caffeina Citrata Effervescens** (**Effervescent Citrated Caffeine**).—**Dose,** ℥j to ℥v ( 4 to 15 gm.).

## THEOBROMINE (NOT OFFICIAL).

**Source.**—An alkaloid from *Cacao theobroma* (*Chocolate Nut*).

**Form.**—Is a crystalline substance, odorless and bitter, less **soluble** in water than caffeine. Is slowly absorbed.

**Dose.**—1 to 8 grs. (0.06 to 0.50 gm.) thrice daily.

**Sodiotheobromine Salicylate** occurs in the **form** of a colorless, odorless powder, with a sweetish, alkaline taste. Is **soluble** in 0.5 its weight of water. It is unstable, absorbs carbon dioxide from the air, and becomes **insoluble.** It is **incompatible** with acids and acid vegetable preparations and juices, the alkaloid being precipitated. It contains 46 per cent. of theobromine and 38 per cent of salicylic acid. **Dose,** 8 to 15 grs. (0.50 to 1 gm.) thrice daily.

**Symptoms.**—Tea and coffee in moderation increase the *appetite* and aid *digestion;* coffee particularly aids peristalsis. Large amounts of tea or coffee cause indigestion, hepatic torpor, and constipation.

**Action.**—*Cerebropsychical functions* are heightened; thought is quicker and clearer, sleep and mental fatigue disappear.

*Medulla.*—The respiratory centre is stimulated and respirations are quickened; the vagus centre undergoes stimulation at times, but its effects are masked by the strong stimulation

of the heart muscle. Large doses kill by paralysis of the respiratory centre.

*Spinal Cord.*—There is but little effect on the cord, but in lower animals its action resembles that of strychnine.

*Muscle.*—It *increases* the irritability of voluntary muscle; the power of contracting becomes greater and requires a lesser amount of stimulation than under normal conditions. Large amounts have the opposite effect.

*Circulation.—Blood pressure* is raised by stimulation of the heart muscle and the number of beats are increased; arterioles are contracted, largely through central vasomotor stimulation, although there may be some action on the walls of these vessels. Large doses of caffeine *depress* the heart muscle, causing a slow, weak, and irregular beat.

*Kidney.*—The amount of urine and its solids after caffeine (tea or coffee) is increased by a direct stimulation of the renal epithelium; when the vasomotor effect of the drug shows itself there is no diuretic effect no matter how strongly the kidney cells may be stimulated. Theobromine has no such strong central action as has caffeine; its kidney action being the same, it is the better diuretic.

**Elimination.**—Very small amounts appear in the urine; caffeine and theobromine are oxidized in the tissues.

**Uses.**—As a diuretic in *dropsies*, cardiac, hepatic, or renal in origin; also in *pleuritic effusions.* To *stimulate* the heart in those cases which are without much dilatation or valvular incompetency; in *adynamic conditions* requiring cardiac stimulation. In *headaches*, either alone or in combination with acetanilid. Alone, or as tea or coffee, in *opium poisoning* and *alcoholic intoxication.* It is contraindicated in *acute nephritis.*

## CALCIUM (CALCIUM).

### The Official Preparations of Calcium.

**Calx** (**Unslaked Lime. Calcium Oxide**).

**Liquor Calcis** (**Solution of Lime. Lime Water**).—A colorless liquid containing 15 per cent. of calcium hydrate.

**Linimentum Calcis** (**Lime Liniment. Carron Oil**).—Contains equal parts of lime water and linseed oil.

**Calcii Carbonas Præcipitatus** (**Precipitated Calcium Carbonate**).—**Dose,** 5 to 20 grs. (0.30 to 1.20 gm.).

**Creta Præparata** (**Prepared Chalk**).—Is native *calcium carbonate,* freed from impurities by elutriation. **Dose,** 5 to 20 grs. (0.30 to 1.20 gm.).

**Mistura Cretæ** (**Chalk Mixture**).—Contains 20 per cent. compound chalk powder. **Dose,** fl℥2 to 4 (8 to 15 c.c.).

**Pulvis Cretæ Compositus** contains prepared chalk, 30 per cent.; acacia, 20 per cent.; sugar, 50 per cent. **Dose,** 15 to 60 grs. (1 to 4 gm.).

**Uses.**—**Slaked Lime** is a corrosive and used to destroy various kinds of *growths* and *phagedenic ulcers.*

**Lime Water** is used as an *antacid;* also in the summer complaint of children and adults either alone or with opium and an astringent like tincture of kino. Any of the above chalk preparations may be used in the same manner. They also may be used as antidotes to oxalic acid.

**Lime Liniment** is used extensively as a dressing in burns.

**Calcii Bromidum** (**Calcii Bromide**).—Exists as a white granular salt, odorless, of a sharp, saline taste and very deliquescent. It is very **soluble** in water and alcohol. Its **dose** is from 0.50 to 2 gms. (8 to 30 grs.).

**Calcii Chloridum** (**Calcium Chloride**).—Exists as white, slightly translucent, hard fragments, odorless and of a sharp, saline taste. It is very deliquescent. Freely **soluble** in water and alcohol. Its **dose** is from 0.30 to 1 gm. (5 to 15 grs.).

**Calcii Sulphas Exsiccatus** (**Exsiccated Calcium Sulphate: Gypsum**).—Its form and uses are familiar, particularly the latter, in the form of plaster bandages in surgery, etc.

**Uses.**—Calcium bromide is used with reference to its bromine ion. The chloride has its particular applications locally on ulcers, etc., while internally it is used to some extent in *gastric catarrh* and *indigestion* of the fermentative type.

**Calcii Hypophosphis** (**Calcium Hypophosphite**) is in **form** of colorless, transparent prisms, or small, lustrous scales, or white crystalline powder; odorless, and having a bitter, nauseous taste, **soluble** in water and **insoluble** in alcohol.

**Dose.**—1 to 5 grs. (0.06 to 30 gm.).

**Calcii Phosphas Præcipitatus** (**Precipitated Calcium Phosphate**) is in **form** white, light, amorphous powder, odorless and tasteless. Almost **insoluble** in water.

**Dose.**—10 to 30 grs. (0.60 to 2 gm.).

**Uses.**—The **hypophosphite** has the same medicinal action as do small doses of phosphorus. The **phosphate** has no advantage over the hypophosphite. They are used in *anæmia, chlorosis, scrofula*, etc.

## CAMPHORA (CAMPHOR).

**Sources.**—A stearopten from *Cinnamomum camphora*, purified by sublimation. From China, Japan, Formosa, and East Asia. It is slightly **soluble** in water (1 : 1300), freely in alcohol, ether, chloroform, oils; it *liquefies* with chloral, menthol, thymol, and phenol.

### The Official Preparations of Camphor.

**Aqua Camphoræ** (**Camphor Water**).—**Dose,** f℥$\frac{1}{2}$ to 2 (15 to 60 c.c.).

**Spiritus Camphoræ** (**Spirit of Camphor**).—10 per cent. **Dose,** f℥$\frac{1}{2}$ to 1 (2 to 4 c.c.).

**Linimentum Camphoræ** (**Liniment of Camphor. Camphorated Oil**).

**Ceratum Camphoræ.**

**Camphora Monobromata** (**Monobromated Camphor**).—**Dose,** 2 to 10 grs. (0.12 to 0.60 gm.).

**Action.**—Is similar to that of the volatile oils, which see.

**Uses.**—*Externally* as a counterirritant and anæsthetic, either alone or in combination with chloral, menthol, or phenol; it is used in *neuralgias.* Mixed with precipitated chalk it forms an antiseptic, stimulating dressing for *indolent ulcers;* also useful in skin diseases, as *urticaria, erythema. erythematous eczema,* etc.

The liniment is used in *sprains, bruises,* and *chilblains.* In solution in oils or with diluting powders it is used as an insufflation in *acute coryza, laryngitis.*

*Internally* as an antispasmodic and carminative in *hysteria, melancholia, dysmenorrhœa;* in *colic* with flatulence, *diarrhœa, dysentery.* In *typhoid* and *adynamic fevers* as a stimulating diaphoretic. As a stimulant in *collapse* and *fainting.*

## CANNABIS INDICA (INDIAN CANNABIS. INDIAN HEMP).

**Source.**—The dried flowering tops of the pistillate plants of *Cannabis sativa* grown in the East Indies, and gathered while the fruits are yet undeveloped and carrying the whole of their natural resin. High altitudes (5000 to 6000 feet) furnish the best quality, although climatic conditions are also factors. American hemp has the same botanical origin, but it is almost worthless. The active principle of cannabis has not as yet been definitely isolated; it is a resinous body the composition of which is unknown.

### The Official Preparations of Indian Cannabis.

**Extractum Cannabis Indicæ** (**Extract of Indian Cannabis**).—**Dose,** $\frac{1}{4}$ to 1 gr. (0.02 to 0.06 gm.).

**Fluidextractum Cannabis Indicæ** (**Fluidextract of Indian Cannabis**).—**Dose**, 2 to 5 ♏ (0.10 to 0.30 c.c.).

**Tinctura Cannabis Indicæ** (**Tincture of Indian Cannabis**).—**Dose**, 15 to 30 ♏ (1 to 2 c.c.).

Preparations of cannabis vary considerably, and it is advised that those which have been tested physiologically be given the preference.

**Symptoms.**—*Large amounts* induce a mental exhilaration during which traits peculiar to the person are exalted; the pupils are dilated, sight and hearing are very acute, ideas flow so rapidly that there is a sense of prolongation of time, and minutes seem hours; there is a sense of well-being and comfort; the thoughts as a rule are pleasurable; there is muscular activity usually of a grotesque nature. The respirations become sighing, there is a fear of impending death; there are periods of unconsciousness from which the patient is easily aroused and able to give coherent answers. There is some cutaneous anæsthesia and loss of muscular power; sleep follows, from which the patient awakes, as a rule, refreshed. Occasionally there are after-effects, such as mental hebetude, vertigo, and headache; nausea and depression are absent.

**Uses.**—As an analgesic it may be used in *headache* and *neuralgia*. As an antispasmodic in *cystitis*, *hysteria*, *chorea*. In *delirium tremens* it is a very uncertain hypnotic.

## CANTHARIS (CANTHARIDES. SPANISH FLY).

**Sources.**—The beetle, *Cantharis vesicatoria*, thoroughly dried at a temperature not over 40° C. Indigenous to central and southern Europe.

**Characters.**—The beetles are about 25 millimetres (1 in.) long and 6 millimetres (¼ in.) wide; flattish, cylindrical, with filiform antennæ, black in the upper part, and ample, membranous, transparent, brownish wings; elsewhere of a

shining, coppery-green color. The powder is grayish-brown and contains green, shining particles. Odor strong and disagreeable; taste slight, afterward acrid. They **contain** *cantharidin*, which is the anhydride of cantharidic acid; water extracts it from the fly; it is **soluble** in alcohol, oils, and liquid petrolatum.

### The Official Preparations of Cantharis.

**Ceratum Cantharidis** (**Cantharides Cerate**).

**Collodium Cantharidatum** (**Cantharidal Collodion**).—Both used externally.

**Tinctura Cantharidis** (**Tincture of Cantharides**).—**Dose**, 1 to 15 ♏ (0.06 to 7 c.c.).

**Action**. *Externally*.—Applied to skin or mucous membrane there ensues a redness, followed by a smarting pain, later by vesicles which unite to form a large blister. Taken internally the same action results along the alimentary tract. Applied for too long a time, sloughing results. Constitutional effects may result from the external use of the drug, as it is absorbed from the blister.

*Internally*.—In large doses it acts as a violent irritant to the *gastrointestinal tract*, with pain and heat in the throat, œsophagus, and stomach, nausea and vomiting of glairy, bloody mucus; diarrhœa follows, with bloody stools and much tenesmus. Absorbed into the circulation, it is **eliminated** by the kidneys, small doses acting as diuretics, while larger cause intense irritation of the genitourinary tract, with hæmaturia, strangury, and priapism; the urine becomes lessened in amount, is albuminous and may cease altogether, while the desire to micturate continues.

The **treatment** for gastrointestinal and genitourinary irritation from overdose consists in the use of demulcents and opiates with stimulants hypodermically.

**Uses.**—*Internally* its use is very limited. It has enjoyed a reputation as an emmenagogue and aphrodisiac; its efficacy is doubtful.

*Externally.*—In *pericarditis* and *pneumonia*, to lessen congestion and inflammation. In *joint effusions*, *articular rheumatism*, *pleurisy*, and around *chronic ulcers;* it is often useful in *neuralgia*. Before applying the cerate it is well to oil the surface in order to dissolve out the cantharidin, thus ensuring a quicker and more thorough action. Cantharidal vesication is contraindicated where any kidney lesion exists.

## CERII OXALAS (CERIUM OXALATE).

**Form.**—A white, granular powder, odorless and tasteless. It consists chiefly of a mixture of the oxalates of cerium, didimyium, and lanthanum, and of other rare earths of the group. It is **insoluble** in water and alcohol.

**Dose.**—1 to 10 grs. (0.06 to 0.60 gm.).

**Action.**—But little is known about the **action** of cerium oxalate; it is **used** in the *vomiting* of *pregnancy*, *seasickness*, and that due to uterine disease. It is highly lauded in *dyspepsia* due to acidity. Its action is supposed to be otherwise than merely local; just as the cause of seasickness is not due to local irritation.

## CHLORALUM HYDRATUM (HYDRATED CHLORAL).

**Sources.**—A crystalline solid, composed of *Trichloraldehyde* and one molecule of water. Chloral is formed by passing dry chloric gas into absolute alcohol to saturation; an oily liquid separates; this is chloral or trichloraldehyde; added to water, crystals separate out—hydrated chloral. True chloral is an oily liquid and is not used in medicine.

**Form.**—Separate, rhomboidal, colorless, transparent crystals having an aromatic, penetrating, slightly acrid odor and a bitterish, caustic taste. It slowly volatilizes in air, is freely **soluble** in all solvents. It liquefies when triturated with an equal part of camphor, thymol, menthol, and carbolic acid.

**Action.** *Central Nervous System.*—In small amounts its influence is confined to the cerebrum, which it depresses, lessening perception and inducing a natural sleep from which the patient is easily aroused; there are no after-effects. Chloral is not analgesic, it will not cause sleep if sleeplessness is due to pain. Larger doses cause a profound sleep; the patient is not easily aroused to complete consciousness; spinal reflexes are much lessened and depression of the medulla is shown by slow and shallow respirations; blood pressure is lowered and the pulse slowed by a direct action on the heart muscle and also by a vasodilatation due to a paralysis of the vasomotor centre in the medulla and possibly by an action on the vessel walls. There is a marked fall of temperature due in part to vasodilatation, as well as diminished heat production. Sensation of pain is somewhat lessened and the muscles are completely relaxed; sleep may last from eight to fifteen hours and is followed by nausea and vomiting, with confusion and headache. In fatal doses death is preceded by *coma* and is due to paralysis of the respiratory centre.

**Absorption and Elimination.**—Chloral is rapidly absorbed, circulates as such and is eliminated as *urochloralic acid* (*chloral + glycuronic acid*) in the urine.

**Poisoning.**—In *acute poisoning* there is marked depression of circulation and respiration, with abolition of reflexes and muscular relaxation, stupor, coma, followed by death from failure of respiration.

**Treatment.**—Maintain bodily heat with hot blankets or bottles; prevent sleeping with *passive exercise*, as flagellation or friction; inject hot, strong coffee into the rectum. Combat

circulatory and respiratory depression with *atropine* cautiously administered; or *ammonium* carbonate. Emesis is, of course, indicated, and if chloral is partly eliminated by the stomach, as is stated by some authorities, emesis or lavage is all the more indicated.

*Chronic Poisoning or Chloralism.*—The continued use of chloral generally results in the *habits* which are seen in mental weakness, anæmia, with respiratory and circulatory disturbances and dementia.

**Administration.**—**Dose**, 5 to 20 grs. (0.30 to 1.20 gm.), well diluted to avoid gastric irritation.

**Uses.**—In *neuralgia*, applied in combination with camphor. As a *hypnotic* in *sleeplessness* from overwork or worry; when hysterical; also in *maniacal excitement*. As an *antispasmodic* in *convulsions* of all kinds (especially strychnine) alone or in combination with potassium bromide, by mouth or per rectum; in *asthma*, *chorea*, and *epilepsy*. In *delirium tremens* with due attention to the weak heart of chronic alcoholism.

## CINCHONA (CINCHONA).

**Sources.**—The dried bark of *Cinchona ledgeriana*, *Cinchona calisaya*, *Cinchona officinalis*, and of hybrids of these, with other species of cinchona. It should yield not less than 5 per cent. of total anhydrous cinchona alkaloids, and at least 4 per cent. of anhydrous ether—soluble alkaloids on assay.

## CINCHONA RUBRA (RED CINCHONA. RED BARK).

**Sources.**—The dried bark of *Cinchona succirubra* or of its hybrids, yielding, when assayed, not less than 5 per cent. of anhydrous cinchona alkaloids. The cinchona trees are indigenous to South America, but are cultivated in the Indies and elsewhere.

There are many **alkaloids** present in cinchona bark, four of which are of importance: *quinine*, *quinidine*, *cinchonine*, and *cinchonidine*. They exist in combination with *kinic* and *kinovic acids*. Tannic acid is also present as *cinchotannic* and *quinotannic acids*.

### The Official Preparations of Cinchona.

**Fluidextractum Cinchonæ** (**Fluidextract of Cinchona**). —**Dose**, 10 to 60 ♏ (0.60 to 4 c.c.).

**Tinctura Cinchonæ** (**Tincture of Cinchona**).—20 per cent. **Dose**, fl℥½ to 2 (2 to 8 c.c.).

**Tinctura Cinchonæ Composita** (**Compound Tincture of Cinchona**).—Made from red cinchona. **Dose**, fl℥1 to 4. (4 to 15 c.c.).

The foregoing preparations are incompatible with solutions containing iron and to a large extent have been replaced by—

### The Alkaloids of Cinchona.

**Quinina**, soluble in 1750 parts of water, 6 parts of alcohol, at 25° C.

**Quininæ Sulphas**, soluble in 720 parts of water, 86 parts of alcohol, at 25° C.

**Quininæ Bisulphas**, soluble in 8.5 parts of water at 25° C. Solution has a blue fluorescence.

**Quininæ Hydrobromidum**, soluble in 40 parts of water, at 25° C.

**Quininæ Hydrochloridum**, soluble in 18 parts of water, at 25° C.

**Quininæ Salicylas**, soluble in 77 parts of water at 25° C. **Dose**, 5 to 15 grs. (0.30 to 1 gm.) or more if needed.

**Cinchonina**, soluble in 3760 parts of water.

**Cinchoninæ Sulphas,** soluble in 58 parts of water.
**Cinchonidinæ Sulphas,** soluble in 63 parts of water.

**Dose.**—Twice as much as the foregoing. They are used as substitutes.

**Action.**—*Locally,* quinine is an irritant to mucous membrane and broken surfaces, but has little action on sound skin. It is an antiseptic and inhibits fermentation and putrefaction.

*Internally.*—In the gastrointestinal tract the flow of gastric and intestinal secretions are increased—appetite and digestion are improved.

*Circulation.*—Small amounts quicken the pulse and raise blood pressure it is thought by direct action on the heart muscle and the walls of the small bloodvessels; although some consider the effect as due to depression of the inhibitory apparatus in the heart, or to centric vasomotor stimulation, since the rise in blood pressure is due largely to vasoconstriction. Large doses slow and weaken the heart by direct depression and cause vasodilatation by centric depression; a fall in blood pressure ensues. On the blood itself quinine lessens the amœboid movement of the leukocytes while the red corpuscles are proportionally increased.

*Respiration.*—Small doses have but little effect—stimulating if anything, while large doses cause a depression, centric in origin.

*Central Nervous System.*—The cerebrum after small doses is stimulated, while very large doses cause a depression of the entire central nervous system.

*Temperature.*—There is but little action on normal temperature. In hyperpyrexia, however, the temperature is lowered, although not always in a marked degree. Thus in pneumonia and pleurisy it has but little effect. The cause of the reduction in temperature is attributed mainly to a retarding action on tissue metabolism.

*Absorption and Excretion.*—Quinine is quite rapidly absorbed and may be detected in the urine within a short

time. Much of it is changed in the tissues. It is chiefly eliminated by the kidneys, but is found in almost all secretions and excretions. The nitrogenous constituents of the urine are considerably diminished after quinine.

*Cinchonism.*—After large doses, or where an idiosyncrasy exists, certain symptoms, as fulness in the head, ringing or buzzing in the ears, partial or complete deafness, disturbed vision, headache, vertigo, and muscular weakness show themselves. They are mainly due to cerebral effect, congestion producing the sense of fulness in the head, ringing in the ears, and deafness. The disordered vision is due to a constriction of the retinal vessels. Cinchonism may be prevented by the use of bromides in full doses. Quinine is contraindicated in *middle ear disease*, in acute *gastrointestinal* and *genito-urinary* inflammations.

**Uses.**—It has been used as an antiseptic in *gonorrhœa* as an injection. Its chief use is that of an antiperiodic in malarial fever of all forms; it acts indirectly as an antipyretic destroying the plasmodium. In periodical conditions, such as *neuralgias, jaundice, asthma, hay fever*, etc. As a stomachic in *dyspepsia* fermentative in origin; *diarrhœa* due to the same.

*Administration.*—Being bitter, quinine is generally given in capsule, or pills; where it is desired to administer a liquid the alkaloid may be given disguised with syrup of licorice or syrup of yerba santa. Warburg's tincture which contains quinine with aromatics, which are synergistic, is favored by many as an antiperiodic.

## COCA (COCA).

**Sources.**—The dried leaves of *Erythroxylon coca* (*Huanuco* coca) or *Erythroxylon truxillense* (*Truxillo* coca), yielding, when assayed, not less than 0.5 per cent. of the ether-soluble alkaloids of coca. They **contain** an alkaloid, *cocaine*, along with tannic acid and other alkaloids. Cocaine

is *methyl-benzoyl-ecgonine* and may be broken up into methyl-alcohol, benzoic acid, and ecgonine. Other radicles as ethyl and other organic acids may be substituted for methyl and benzoyl; in this way many of the newer synthetic artificial alkaloids are formed whose merits are still *sub judice*. Cocaine represents the medicinal activity of coca leaves.

**Symptoms.**—Small doses stimulate the mental faculties and create a sense of well-being; after somewhat larger doses there follow garrulity and restlessness; the pulse is accelerated and respiration is quick and deep. The reflexes are increased; there may be tremors, sometimes there are convulsions, or, instead, there may be collapse and fainting, with a slow, weak pulse and feeble respiration.

**Action.** *Central Nervous System.*—In small doses the cerebral cortex is stimulated, larger doses cause an increased stimulation which passes downward stimulating the medulla and reflex centres in the cord; a descending depression follows, but the succession may be irregular and the central nervous axis shows mixed symptoms of stimulation and depression.

*Respiration.*—Rendered quicker and deeper by stimulation of the respiratory centre. Large doses render respiration weak and cessation is the result of paralysis of the centre.

*Circulation.*—Blood pressure is raised by an acceleration of the heart, which may be due to a direct action on the muscle itself or the accelerator nerves. Peripheral vessels (arterioles) are contracted by centric vasoconstrictor stimulation. Large doses cause a great fall of blood pressure by a direct depression of the heart muscle and of the vasomotor centre.

*Temperature.*—Small doses have no effect; large doses cause a rise.

**Local Action.**—On sound skin cocaine has little action. On mucous membrane or subcutaneously the part to which it is applied blanches from arteriolar constriction, later it becomes redder than normal from dilatation. Sensation to pain is lost; other end organs are also affected, as in the nose

the sense of smell is lost; the tongue loses tactile sensibility and taste for bitter substances. All due to paralysis of sensory nerve endings of all kinds.

*Eye.*—Whether locally applied, or systemically, the pupil dilates, but still reacts to light. It causes mydriasis by stimulating the ends of the *sympathetic,* which supplies the radiating fibres of the iris.

**Cocaine Habit.**—The continued use results in digestive disorders, emaciation, muscular twitchings, insomnia, malaise, fainting and other symptoms of a disordered nervous system as a lowered moral tone, etc. The **treatment of acute cocaine poisoning** consists in the inhalation of amyl nitrite, chloroform, or whiskey. The **chronic poisoning** consists of isolation, the withdrawal of the drug gradually, not substituting morphine to combat depression, for there is danger of engrafting this habit, and the use of dietetic and other treatment to suit the case.

### The Official Preparations of Coca.

**Fluidextractum Cocæ** (**Fluidextract of Coca**).—**Dose,** fl℥½ to 1 (2 to 4 c.c.).

**Vinum Cocæ** (**Wine of Coca**).—**Dose,** fl℥ij to fl℥j (0.8 to 30 c.c.).

**Cocaina** (**Cocaine**).—**Dose,** $\frac{1}{6}$ to 1 gr. (0.01 to 0.06 gm.).

**Cocainæ Hydrochloridum** (**Cocaine Hydrochloride**).—**Dose,** same as the alkaloid itself.

**Cocainæ Oleatum** (**Oleate of Cocaine**).—5 per cent. in strength. Used externally.

**Uses.**—*Internally.* Coca is used as a tonic in *melancholia* and *debilitated conditions* generally. In the tremors of *alcoholism*, *paralysis agitans*, and *chorea.* Cocaine may be used in *gastritis*, *obstinate vomiting*, and *gastralgia.*

*Externally.*—Subcutaneously for the relief from pain in minor surgical operations, in *boils* and *abscesses.* It is useful

in *ulcers*, *hemorrhoids*, and *fistula*. Solutions of from 2 to 10 per cent. are applied in *coryza*, *hay fever*, *laryngitis*, and *nasal hemorrhage*. Two per cent. solutions applied to the urethra two or three times secure anæsthesia. In the eye as a *mydriatic;* in *conjunctivitis* and *corneal ulcers*.

## COLCHICUM (CORM AND SEED).

**Sources.**—Colchici cormus and colchici semen are the corm and seed of *Colchicum autumnale*, a plant indigenous to Europe. On assay, the corm should yield not less than 35 per cent. and the seed not less than 55 per cent. of the alkaloid, *colchicine*.

### The Official Preparations of Colchicum.

**Extractum Colchici Cormi** (**Extract of Colchicum Corm**).—**Dose**, $\frac{1}{2}$ to 2 grs. (0.03 to 0.12 gm.).

**Fluidextractum Colchici Seminis** (**Fluidextract of Colchicum Seed**).—**Dose**, 1 to 5 ♏ (0.06 to 0.30 c.c.).

**Tinctura Colchici Seminis** (**Tincture of Colchicum Seed**).—**Dose**, 5 to 15 ♏ (0.30 to 1 c.c.).

**Vinum Colchici Seminis** (**Wine of Colchicum Seed**).—**Dose**, 30 to 60 ♏ (2 to 4 c.c.).

**Colchicine** is official. **Dose**, $\frac{1}{64}$ to $\frac{1}{240}$ gr. (0.00025 to 0.001 gm.).

**Symptoms.**—In therapeutic doses colchicum produces no symptoms.

**Poisoning.**—The effects do not appear for some time and are due to gastroenteritis. They are pains in the abdomen, nausea, vomiting, and diarrhœa, with bloody stools. Symptoms of collapse follow; there is muscular weakness; a paralysis beginning at the extremities and extending upward involving the respiratory centre and causing death. Consciousness

remains till the end, although there may be mental confusion and vertigo. The symptoms seen aside from those of gastro-intestinal irritation may be due to this influence or, as is more probable, to depression and paralysis of the central nervous system.

**Uses.**—Colchicum is used empirically as an alterative and the little knowledge we have of its action may scarcely be applied for its rational use. Colchicum is almost a specific in *gout*, aborting oncoming attacks or lessening the severity after the disease is once started. It is highly recommended in *chronic rheumatism* and in *rheumatoid arthritis*.

## COLLODIUM (COLLODION).

**Sources.**—A solution of guncotton (*pyroxylin*), 4 parts, in a mixture of ether 75 parts, and alcohol 25 parts.

**Form.**—It is a clear, colorless liquid, with the odor of ether and very inflammable. It should be kept in *cork-stopped* bottles.

### The Official Preparations of Collodium.

**Collodium Cantharidatum (Cantharidal Collodion).**—Contains 60 per cent. of cantharides.

**Collodium Flexile (Flexible Collodion).**—It is rendered flexible by addition of castor oil 3 parts, and Canada turpentine 5 parts, to 92 parts of collodion.

**Collodium Stypticum (Styptic Collodion).**—It contains 20 per cent. of tannic acid.

**Uses.**—*Collodion* is used as a protective; when applied the ether and alcohol evaporate leaving a thin, contractile film. *Flexible collodion* is used to advantage on account of its flexibility.

*Cantharidal collodion* is used as a blistering agent; it has advantages over cantharidal cerate, but its action cannot be controlled so well as that of the cerate.

*Styptic collodion* is used wherever the action of tannin is desired, as where a greater constringing power is wanted than that furnished by collodion alone. It may be used to check superficial hemorrhages.

## COPAIBA (COPAIBA. BALSAM OF COPAIBA).

**Sources.**—The oleoresin derived from one or more South American species of copaiba.

**Form.**—It is a yellow, transparent, viscid liquid, having an aromatic odor and an acrid, bitter taste. It contains a volatile oil and a resin, 99 per cent. of which is *copaibic acid.*

**Dose.**—2 to 15 ♏ (0.12 to 1 c.c.).

### The Official Preparations of Copaiba.

**Oleum Copaibæ (Oil of Copaiba)** is a volatile oil distilled from copaiba.

**Dose.**—5 to 15 ♏ (0.30 to 1 c.c.).

**Action and Uses.**—Copaiba is readily absorbed and its action is analogous to that of the volatile oils. It is **eliminated** largely by the kidneys although some is thrown off by the pulmonary mucous membrane. It acts as a *diuretic* through stimulation of the renal epithelium and large doses are liable to cause irritation, with strangury, bloody urine, etc., after the nature of turpentine. After large dosage or where idiosyncrasy exists there is often an eruption roseolar in character and which may become papular. At times the eruption is said to have caused eczema which is preceded by a scarlatiniform eruption. Cases of **poisoning from copaiba** are not uncommon, particularly as the drug is somewhat indiscriminately indulged in by the laity.

The symptoms are the same as those produced by turpentine in the main.

The drug is **used** in *subacute* and *chronic bronchitis* and *bronchorrhœa*. Its chief application lies in its stimulant, antiseptic action on the genitourinary tract. It is used in *gleet, subacute gonorrhœa, cystitis, pyelitis,* and in *vaginitis. Externally* it is used at times as a dressing for *indolent ulcers* and in *skin diseases,* as *psoriasis, eczema,* and *lupus.*

## CREOSOTUM (CREOSOTE).

**Form.**—A mixture of phenols and phenol derivatives, chiefly *guaiacol* and *creosol,* obtained during the distillation of wood-tar, preferably that derived from the beech (*Fagus sylvatica* or *Fagus ferruginea,* temperate zone). It is a nearly colorless or pinkish liquid, becoming darker with age; has a smoky, penetrating odor and a caustic, burning taste. Is **soluble** in about 140 parts of water, forming a solution not perfectly clear. Is freely *soluble* in absolute alcohol.

**Dose.**—The dosage of creosote enjoys considerable latitude, beginning with 0.03 gm. and gradually increasing until 3 or 4 c.c. are reached. It is best taken on a full stomach, preferably in capsules.

**Aqua Creasoti (Creosote Water).**—Contains 1 per cent. **Dose,** fl℥1 to 4 (4 to 15 c.c.).

**Action.**—In its action and effects creosote resembles carbolic acid. *Locally* creosote has a slightly benumbing effect due to its paralyzing action on nerves. It is also an active antiseptic. *Internally.* It is rapidly absorbed and is eliminated by the kidneys, lungs, and other channels. On account of it being eliminated by the lungs it is used as an antiseptic in diseases of the lungs, as *phthisis pulmonalis* and *gangrene.* It is also inhaled in *chronic bronchitis, phthisis,* and *congestions* of the upper air passages. It is also used in *obstinate vomiting* and *gastralgia.*

## CUBEBA (CUBEB).

**Sources.**—The dried, unripe, but fully grown fruit of *Piper cubeba*, Java. Cubebs contain a volatile oil and a resin, the latter containing *cubebic acid.* There is also present *cubebin,* which deposits in time from the oleoresin and is worthless.

### The Official Preparations of Cubeb.

**Oleum Cubebæ** (**Oil of Cubeb**).—The volatile oil of cubeb. **Dose,** 1 to 5 ♏ (0.06 to 0.30 gm.).

**Oleoresina Cubebæ** (**Oleoresin of Cubeb**).—**Dose,** 10 to 15 ♏ (0.60 to 1 c.c.).

**Fluidextractum Cubebæ** (**Fluidextract of Cubeb**).—**Dose,** 10 to 30 ♏ (0.60 to 2 c.c.).

**Trochisci Cubebæ** (**Troches of Cubeb**).—Each contains 0.02 grams of the oleoresin.

**Action and Uses.**—Cubeb finds its most extensive use as a stimulant antiseptic in *subacute gonorrhœa* and *cystitis;* also in *bronchitis* and *bronchorrhœa.* The troches are used in relaxed conditions of the throat.

## CUPRUM (COPPER).

The only salt of copper official and in practical use to-day is the sulphate and its use is limited.

**Cupri Sulphas** (**Copper Sulphate**).—Exists as prismatic blue crystals, odorless and of metallic, styptic taste. It is efflorescent and freely soluble in water.

**Dose.**—As an astringent, $\frac{1}{6}$ to 2 grs. (0.01 to 0.12 gm.). As an emetic 5 to 10 grs. (0.30 to 0.60 gm.).

**Symptoms.**—In *small doses,* aside from its astringent local action, the salt has but little effect; *large doses* are emetic due to *local* irritant action; very large doses are violently irritant

and produce nausea, vomiting of bluish or greenish material, purging of blood and greenish mucus. Symptoms of collapse may follow with weak pulse and respiration, headache, delirium, unconsciousness, convulsions, and paralysis. In the stomach and intestine the salt is broken up, the copper unites with albumin, forming the insoluble albuminate. Albumin (milk, white of egg, flour) is the *antidote*. Emetics are not needed as a rule, but gastric lavage may be practised.

**Uses.**—The sulphate is used as a local astringent for *ulcers* and *wounds;* a 1 per cent. solution as an injection in *gonorrhœa* is useful. Applied in *relaxed conditions* of the throat. The crystals are used to touch *granulations* on eyelids and elsewhere. The sulphate is the chemical antidote in phosphorus poisoning. *Internally* it is used in chronic dysentery combined with opium; also in gastrointestinal catarrh.

## DIGITALIS.

**Sources.**—The leaves of *Digitalis purpurea*, collected from plants of the second year's growth, at the commencement of flowering. Is indigenous to Europe, but cultivated elsewhere. The leaves contain four *glucosides: digitalin* and *digitoxin*, both **soluble** in alcohol and **insoluble** in water; *digitalein* and *digitonin*, **soluble** in water and **insoluble** in alcohol; *digitophyllin* is also present and resembles digitoxin, while *digitin* is an inert substance.

The chemical composition of these substances is still obscure and many of the preparations called digitalin, digitoxin, etc., are not really such, but mixtures of the above glucosides.

### The Official Preparations of Digitalis.

**Extractum Digitalis (Extract of Digitalis).**—**Dose,** $\frac{1}{6}$ to 1 gr. (0.01 to 0.06 gm.).

**Fluidextractum Digitalis** (**Fluidextract of Digitalis**).—**Dose**, $\frac{1}{2}$ to 3 grs. (0.03 to 0.20 gm.).

**Infusum Digitalis** (**Infusion of Digitalis**).—1.5 per cent. **Dose**, 1 to 2 fʒ (4 to 8 c.c.).

**Tinctura Digitalis** (**Tincture of Digitalis**).—10 per cent. **Dose**, 5 to 30 ♏ (0.30 to 2 c.c.).

**The Following Are Not Official but Enjoy Some Popularity.**

**Digitalin.**—Its dose varies from $\frac{1}{30}$ to 1 gr. (0.002 to 0.06 gm.).

**Digitoxin.**—Its dose varies from $\frac{1}{200}$ to $\frac{1}{100}$ gr. (0.0003 to 0.0006).

**Digitalein**—**Dose**, $\frac{1}{64}$ to $\frac{1}{32}$ gr. (0.001 to 0.002 gm.).

**Symptoms.**—To mucous membranes digitalis is a distinct irritant and internally in large toxic doses gives rise to gastro-intestinal as well as circulatory disturbances, as nausea, vomiting, and purging, abdominal pains, a rapid, irregular, and compressible pulse, syncope which is more apt to occur when the patient raises up. There are feeble respiration, headache, delirium, stupor, and convulsions.

**Action.** *Nervous System.*—Its action is confined to the medulla, although the blood supply to the brain is increased; no distinct signs show themselves. In the medulla the vagus and vasomotor centres are stimulated by small doses; after larger doses other centres become more active and the vomiting seen is often due in part to centric stimulation; *respirations* at first are increased; afterward depressed, due to action on the respiratory centre; other effects on the nervous system seen must be attributed to circulatory changes.

*Circulation.*—After medicinal doses, digitalis stimulates the heart muscle, lengthening and strengthening systole; the volume of blood expelled from the heart is greater than normal. The heart is also slowed by centric and peripheral (cardiac) vagal stimulation, both of which inhibit the heart, lengthening diastole; thus more blood flows into the heart.

Blood pressure is raised—by increased heart action—by a contraction of peripheral vessels, brought about by a direct action on their walls and by a centric vasomotor stimulation. The character of the pulse is altered; its rhythm is slowed and the pulse-wave is increased.

After larger doses, the pulse-rate is slowed more, and is irregular, which is due to excessive inhibition; the pulse-wave is lessened and pressure falls. Later an opposite condition prevails with an accelerated pulse, due to excessive stimulation of the heart muscle, with possibly a paralysis of the vagi. Arrhythmia may occur and is the result probably of vagus effect on the auricle while the ventricle continues to contract. This takes place in both sides of the heart, but there is no arrhythmia between the auricles or between the ventricles. Later the pulse becomes very fast and the heart extremely irregular; delirium cordis follows and the heart stops in diastole.

*Kidney.*—The urine is increased after digitalis not through any action on the secretory epithelium, but through increased blood pressure; it is claimed that some of the principles of digitalis (digitalein) increase the activity of the secretory epithelium, but it has not been proved.

**Cumulative Action.**—After giving the drug for a time and that without increasing the dose, there suddenly develop symptoms of acute poisoning; it is thought that the drug is stored up in the tissues and, suddenly liberated, overwhelms the patient.

**Uses.**—Digitalis may be used in all cases marked by loss of compensation, as in *acute dilatation* or the *dilatation following valvular incompetency. Extensive fatty degeneration, atheroma, aneurysm, simple hypertrophy,* all contraindicate its use. In *dropsies, cardiac* or *renal,* it is indicated; also in *irritable* heart, in *palpitation* and *pulmonary congestion,* in exhausting fevers as *typhoid.* It is also useful in *delirium tremens* when the pulse is soft and compressible; it should be given in large doses.

It is very useful in *pneumonia* during the second stage, *but only* when circulatory disturbances present themselves. As the physiological antidote in *aconite poisoning*, also in *mushroom poisoning*, it should be preceded by a more rapidly acting drug as ammonia or alcohol.

The **treatment for digitalis poisoning** consists in the application of emetics, and these only when the heart is not too much depressed.

Tannic acid is the chemical antidote and is of value when the drug has not been absorbed. Stomach lavage may be practised for the same reason. Diffusible stimulants, as alcohol or ammonia, are of great value, more so perhaps than aconite, which is the physiological antidote. A recumbent position is imperative. Sudden exertion is very liable to prove fatal.

## ERGOTA (ERGOT).

**Sources.**—The sclerotium of *Claviceps purpurea* (a fungus), replacing the grain of rye, *Secale cereale*. It should be moderately dried and not exposed to a damp atmosphere. It is worthless after one year.

### The Official Preparations of Ergot.

**Extractum Ergotæ (Extract of Ergot).**—**Dose**, 3 to 15 grs. (0.18 to 1 gm.).

**Fluidextractum Ergotæ (Fluidextract of Ergot).**—**Dose**, 1 to 2 fl℥ (4 to 8 c.c.).

**Vinum Ergotæ (Wine of Ergot).**—**Dose**, 1 to 4 fl℥ (4 to 15 c.c.).

Of the principles contained in ergot none of them individually represents the drug in its **action**. Adopting the results of the researches of Kobert and as verified and extended by Jacoby, ergot contains three classes of principles which

together cause the various phenomena which characterize the action of the drug. They are: *ergotinic acid*, a nitrogenous glucoside; *cornutine*, a mixture of alkaloids; and *sphacelinic acid* (Kobert), a nitrogen-free mixture, found by Jacoby to consist of *sphacelotoxin* (a nitrogen-free resin), which is active and to which unstriped muscle effects are due; it enters in combination with various inert substances present in ergot as *secaline* (inert) forming *secalintoxin* (active), and with *ergochrysin* (inactive) forming *chrysotoxin* (active).

To sphacelinic acid and its combinations are ascribed the various circulatory effects as: (1) Constriction of peripheral vessels which is due to centric vasomotor stimulation and direct action on the vessel walls, and which is followed by a rise in blood pressure; the arteriolar constriction may be so severe as to lead to gangrene of parts. (2) Increased peristalsis of stomach and intestine (vomiting and purging), as well as muscular contractions of the pregnant uterus, which may be *intermittent* or *tetanic* according to the dose. These symptoms seem to be due in part to action on the cord and also peripheral.

To cornutine, effects pointing first to stimulation, later to depression and paralysis of the medullary centres, causing death by paralysis of the respiratory centre.

Ergotinic acid has but little action when absorbed from the stomach and intestines, although introduced into the system unaltered by the juices of the alimentary tract, depression of the central nervous system follows.

**Symptoms of Ergotism.**—*Acute ergotism* is rare, the result usually of an overdose. The chronic form manifests itself usually in one of two phases, *gangrenous* and *spasmodic*. Both are ushered in by the same symptoms as itching, formication, and other sensory disturbances, as hyperæsthesia and anæsthesia, beginning at the extremities. The *gangrenous* is marked by an increasing numbness generally at the extremities, the parts become darker in color, dry and shrunken; toes, etc., may fall off without hemorrhage; all

due to prolonged spasm of vessels, consequent loss of blood supply; then death of the parts. In the *spasmodic* there are paroxysmal convulsions which later become continuous. The special senses are often involved, as dimness of vision, loss of hearing, etc. Gastrointestinal symptoms are marked with violent cramps and purging. The **treatment** is symptomatic.

**Uses.**—The chief use of ergot is to promote *uterine contractions in labor;* it is to be *avoided* in the first stage, may be used with care in small doses in the second stage if there is *inertia*; it may be used in the third to ensure the expulsion of the placenta and clots. It is very useful in *postpartum hemorrhage.* In *hemorrhage* from the *kidney, stomach, intestines, uterus,* and *lungs* it is used. Also in *congestive dysmenorrhœa, menorrhagia;* in *pulmonary, cerebral,* and *spinal congestions;* also in *congestive headaches* and *diabetes insipidus.*

## ÆTHYLIS CHLORIDUM (ETHYL CHLORIDE).

**Form.**—A haloid derivative (monochlor-ethane), prepared by the action of hydrochloric acid gas upon absolute ethyl alcohol. It is a colorless, mobile, inflammable, and very volatile liquid of a characteristic agreeable odor and burning taste, of a low boiling point and which produces intense cold by its evaporation. It is sold in glass bottles in which the opening is very small and which is closed by a tightly fitting cap. Held in the hand, bodily heat vaporizes the ethyl chloride, and if the vapor be brought into contact with the skin, local anæsthesia follows, the result of the refrigeration of the part. It is useful in *minor surgical operations* of all kinds, from that of opening a *boil* to *paracentesis abdominis.* It is also useful in *neuralgia* for the relief of pain; caution must be exercised in its use on account of its inflammability, and also that after the too lengthy refrigeration, necrosis of parts may follow.

## EUCALYPTUS (EUCALYPTUS).

**Source.**—The leaves of *Eucalyptus globulus*, collected from the older parts of the tree. The tree is indigenous to Australia, but is cultivated elsewhere in swampy districts.

**Fluidextractum Eucalypti** (**Fluidextract of Eucalyptus**). —**Dose**, 15 to 30 ♏ (1 to 2 c.c.).

Eucalyptus leaves contain a volatile oil which is obtained by distillation; it is obtained also from other species, as the *oleosa*, etc. The oil is official as the **Oleum Eucalypti**. It is a colorless liquid, having a characteristic, aromatic, and distinctly camphoraceous odor, and a pungent, spicy, and cooling taste. Is **soluble** in all proportions in alcohol, as is also its active principle **Eucalyptol**, an organic oxide (cineol). Its properties resemble those of the oil. Their dose is the same. **Dose**, 1 to 5 ♏ (0.06 to 0.30 c.c.).

Their action is that of the volatile oils in general.

**Uses.**—Being eliminated by the lungs and kidneys, the oil and eucalyptol form valuable expectorants and diuretics. By increasing peristalsis they are useful in flatulence, etc. The fluidextract has enjoyed a reputation as an antimalarial, but is far inferior to quinine. It is used as a *bitter*, also in *catarrhal conditions* of the *alimentary*, *pulmonary*, and *genitourinary* tracts.

## FERRUM (IRON).

### The Chief Official Preparations of Iron.

**Ferrum Reductum** (**Reduced Iron. Quevenne's Iron**). —An impalpable, tasteless, gray powder; is not astringent. **Dose**, 1 to 5 grs. (0.06 to 0.30 gm.).

**Ferri Hydroxidum** (**Ferric Hydroxide**).—A soft magma made by adding 100 parts of the solution of ferric sul-

phate to 138 parts of aqua ammonia and water q. s. for 300 parts. Used as an antidote for arsenic. **Dose**, 60 c.c. repeatedly.

**Ferri Hydroxidum cum Magnesio Oxido** (**Ferric Hydroxide with Magesium Oxide**).—A similar preparation to above, but the iron is precipitated with magnesia instead of ammonia. **Dose** and **use** the same.

**Ferri Carbonas Saccharatus** (**Saccharated Ferrous Carbonate**).—Made by precipitating $FeSO_4$ with $NaHCO_3$ in the presence of sugar to prevent oxidation; it is easily oxidized nevertheless. **Dose**, 2 to 10 grs. (0.12 to 0.60 gm.).

**Massa Ferri Carbonatis** made in the same way as above, the carbonate of sodium being used instead. The *ferrous* carbonate is soon oxidized into the hydrate.

**Pilulæ Ferri Carbonatis** (**Blaud's Pills**).—These are made in the same way as the mass. They should be freshly made when wanted. All the carbonates are used in anæmia, chlorosis, and as chalybeates.

**Ferri Sulphas** (**Ferrous Sulphate**).—Large, pale, bluish-green crystals with a saline, astringent taste; soluble in water; unstable in moist air. **Dose**, 1 to 5 grs. (0.06 to 0.30 gm.).

**Ferri Sulphas Exsiccatus** (**Dried Ferrous Sulphate**).—The above from which the water of crystallization has been driven off by heat. Is a grayish-white powder, **soluble** in water. **Dose**, $\frac{1}{2}$ to 5 grs. (0.03 to 30 gm.).

**Ferri Iodidum Saccharatum** (**Saccharated Ferrous Iodide**).—Non-official. A yellowish-white, very hygroscopic powder, with a sweetish, iron taste; **soluble** in water. **Dose**, 2 to 5 grs. (0.12 to 0.30 gm.).

**Pilulæ Ferri Iodidi** (**Pills of Ferrous Iodide**).—Each contains 0.04 gm. of iron. **Dose**, 1 to 2 pills.

**Syrupus Ferri Iodidi** (**Syrup of Ferrous Iodide**).—Contains about 5 per cent. of ferrous iodide. **Dose**, fl$\frac{1}{2}$ss to 1 (2 to 4 c.c.).

The iodides are used in anæmia of specific origin, and in glandular scrofula.

**Tinctura Ferri Chloridi** (**Tincture of Ferric Chloride**).—One of the best and most extensively used preparations. It is very styptic and astringent; is very destructive to teeth and should be taken well diluted through a glass tube. Is used locally on indolent ulcers and as an astringent application in relaxed conditions of the throat; internally it is used as a tonic and diuretic.

**Liquor Ferri et Ammonii Acetatis** (**Solution of Iron and Ammonium Acetate**).—May be used in anæmia; also as a diuretic in chronic desquamative nephritis. **Dose,** fℨ½ to 1 (15 to 30 c.c.).

**Ferri et Potassii Tartras** (**Iron and Potassium Tartrate**).—Is not very constipating. Taste is agreeable and it is compatible with alkalies. **Dose,** 10 to 30 grs. (0.60 to 2 gm.).

**Ferri et Quininæ Citras Solubilis.**—Is very unpleasant to take. **Dose,** 5 to 10 grs. (0.30 to 0.60 gm.).

**Ferri et Strychninæ Citras.**—**Dose,** 2 to 5 grs. (0.12 to 0.30 gm.).

**Syrupus Ferri, Quininæ et Strychninæ Phosphatum.**—**Dose,** 2 to 4 c.c. The foregoing three are of additional value on account of the other ingredients.

**Liquor Ferri Subsulphatis** (**Monsel's Solution**).—Is of value as an astringent gargle. **Dose,** 2 to 10 ♏ (0.12 to 0.60 c.c).

There are many organic (proteid) combinations on the market, of which the albuminate and peptonate are types. Some are stated to be hæmoglobin preparations. Examples are:

**Ferratin.**—Prepared from the white of egg; it contains 6 to 8 per cent. of iron. It is more readily absorbed than most preparations. **Dose,** 2 to 15 grs. (0.12 to 1 gm.).

**Hæmatogen.**—Prepared from egg yolk. **Dose,** as above.

**Hæmogallol.**—Prepared from hæmoglobin by reduction with pyrogallol. **Dose,** the same.

There are many others of more or less merit. Those

mentioned seem to be absorbed more readily and are less prone to cause gastric disturbances.

**Action and Uses.** *External.*—Ferrous or ferric salts have no action on unbroken skin, but on mucous membrane they are distinctly astringent and hæmostatic, producing the latter largely through coagulation of the blood, which acts as a barrier.

*Internally.*—In the mouth the preparations of iron cause an increased flow of saliva, blacken the tongue and teeth. On the digestive tract, the slight irritation caused increases the blood supply and secretions—act as stomachics. Larger doses, continued, cause an impairment of digestion by reason of the double decomposition which takes place between the HCl of the gastric juice and the iron salts, excepting the chloride and possibly the organic combinations.

The absorption of iron is under much discussion; but whether organic or inorganic iron is given, it is evidently absorbed in organic combination, is stored up in the various tissues, notably the spleen and liver, from which the small amounts needed by the system are taken for the formation of hæmoglobin. Iron salts are said to increase the formation of red blood corpuscles. Iron is eliminated by the cæcum and colon, passes from the bowel as the sulphide which causes the characteristic black stools.

Iron is **used** mainly in *anæmia, chlorosis,* and conditions dependent thereon, as *amenorrhœa, menorrhagia,* and *dysmenorrhœa,* to increase the hæmoglobin. Also in *various nervous affections* due to anæmia, as *chorea, epilepsy,* etc. Also as a general tonic to improve appetite and digestion. All iron preparations are more or less constipating and laxatives are required. Iron is also used in *fatty degeneration* and *dilatation* of the heart. As an *astringent* in *diarrhœa* and *dysentery.* Also as a *hæmostatic* in the *hemorrhages* of anæmia (tincture of ferric chloride), also in *hemorrhages* from the *stomach* and *bowel* (sulphate), from the *kidneys* and *lungs.*

*Locally.*—As *styptics* and as astringent applications for *indolent ulcers*

## LIQUOR FORMALDEHYDE (SOLUTION OF FORMALDEHYDE).

**Form.**—A solution containing not less than 37 per cent. by weight of absolute formaldehyde, an oxidation product of methyl alcohol. Is miscible in all proportions of water and alcohol. Formaldehyde solution is a colorless liquid having a peculiar pungent odor and caustic taste. Its vapor is very irritating.

## GALLA (NUTGALL).

**Sources.**—Excrescences on *Quercus infectoria*, caused by the puncture and deposited ova of *Cynips tinctoria.*

**Form.**—Are hard, globular bodies, blackish gray in color, surface tuberculated and having a central cavity which contains the fly (cynips).

Galls contain from 15 to 75 per cent. of tannic acid and about 2 per cent. of gallic acid as the active principles.

### The Official Preparations of Galla.

**Tintura Gallæ (Tincture of Nutgall).**—Twenty per cent. **Dose**, 15 ♏ to f℥j (1 to 4 c.c.). **Used** internally as an astringent in *hæmatemesis* and *dysentery;* externally to check hemorrhages.

**Unguentum Gallæ (Nutgall Ointment).**—Twenty per cent. **Used** in skin diseases, as *eczema* and *herpes*, and in *hemorrhoids, prolapsed rectum, fissured nipples*, and *indolent ulcers.*

## ACIDUM TANNICUM (TANNIC ACID. TANNIN).

**Form.**—A yellowish-white, amorphous powder or scales, odorless and a characteristic, astringent taste. Is freely **soluble** in water, glycerin, and alcohol.

**Reactions.**—Coagulates albumin, gelatin; precipitates alkaloids from solution; also iron, lead, and silver. **Dose**, 2 to 15 grs. (0.12 to 1 gm.).

### The Official Preparations of Tannic Acid.

**Collodium Stypticum.**—Used locally.

**Glyceritum Acidi Tannici** (**Glycerite of Tannic Acid**).—Twenty per cent. tannin.

**Trochisci Acidi Tannici.**—0.06 gm. in each. Used in relaxed conditions of the throat.

**Unguentum Acidi Tannici.**—Twenty per cent. tannin. Used externally.

**Action.**—The action of tannin is local wherever applied. When brought into contact with the tissues, it unites with the proteids and constringes the parts; in the mouth and on all glandular surfaces, secretions are checked. *Large doses* in the stomach, when unprotected by food, cause vomiting, and if any reach the intestine, diarrhœa. Bleeding is checked by coagulation of the blood, the resulting clot forming a plug in the vessel. It is claimed that tannin also constringes the vessels through action on their walls; this may be so. Tannin is converted, in the intestine, into gallic acid, which is absorbed as such; some is oxidized in the tissues, the remainder eliminated by the kidneys.

**Uses.** *Externally and Locally.*—As an application on *indolent ulcers* and *bed-sores;* in skin diseases, as *intertrigo, chronic desquamative eczema, sycosis;* on *sore nipples;* it is also useful in *hyperidrosis* of the axillæ, hands, feet, and genitals. The aqueous solution is very good in *leucorrhœa.*

The glycerite is used in *stomatitis, pharyngitis,* and *tonsillitis.* The suppositories are used in *rectal ulcers, prolapse, hemorrhoids* and *fissure.*

*Internally* its use is limited to *hæmatemesis, intestinal hemorrhages;* in *diarrhœa* and *dysentery,* acute or chronic. Also as an *antidote* in *alkaloidal poisoning.*

## ACIDUM GALLICUM (GALLIC ACID).

**Form.**—An organic acid usually prepared from tannic acid. White or pale fawn-colored, silky needles or crystals; odorless, taste slightly acidulous. **Soluble** in 83.7 parts of water, 4.14 of alcohol at 25° C.

**Action.**—Gallic acid does not coagulate albumin in the marked manner that tannin does. It is feebly astringent, and does not cause intestinal disturbances. It is claimed that gallic acid is a distant-acting astringent, checking hemorrhage at points remote and inaccessible, doing so by action through the blood. **Dose,** 5 to 30 grs. (0.30 to 2 gm.).

**Uses.**—*Externally* for the same conditions as tannin. *Internally* it is used chiefly to control *hemorrhages* from the kidneys, lungs, and intestines, and in the *night sweats* of phthisis.

## GAMBIR (GAMBIR. PALE CATECHU).

(To replace Catechu, U. S. P. 1890.)

**Source.**—An extract prepared from the leaves and twigs of *Ourouparia gambir.* A native of Malacca, Sumatra, and Cochin China.

It **occurs** in the form of irregular masses, or cubes about one inch in diameter; deep yellowish or reddish brown externally and pale yellowish internally; it is light, porous, and odorless, with a sweetish, astringent taste. **Dose,** 10 to 30 grs. (0.06 to 2 gm.).

It **contains** catechutannic acid, soluble in water and catechuic acid or catechin soluble in alcohol and ether.

### The Official Preparations of Gambir.

**Tinctura Gambir Composita** (**Compound Tincture of Gambir**).—**Dose**, fl$\mathfrak{Z}\frac{1}{2}$ to ij (2 to 8 c.c.).

**Trochisci Gambir** (**Troches of Gambir**).—Each contains 0.06 gm. 1 gr.

**Uses.**—The value of gambir depends on its contained tannic acid (for its action see Galls). *Externally* the tincture or troches are employed as a mild astringent in pharyngitis and ptyalism. As a lotion the tincture is used in *fissured nipples*, *chronic ulcers*, *spongy gums*, and *aphthous stomatitis*. *Internally* in *serous diarrhœa*, a purge being first employed; also in *dysentery* and in *bronchitis*.

## GENTIANA (GENTIAN).

**Sources.**—The dried rhizome and roots of *Gentiana lutea*, a plant indigenous to Central Europe. The root *contains* a bitter glucoside, *gentiopicrin*, and *gentisic acid*. Gentian is said to contain no tannin; the dark-green color which results at times when iron preparations are mixed with those of gentian is thought to be due to a reaction which takes place between the gentisic acid and the iron.

### The Official Preparations of Gentian.

**Extractum Gentianæ** (**Extract of Gentian**).—Aqueous. **Dose**, 2 to 10 grs. (0.12 to 0.60 gm.).

**Fluidextractum Gentianæ** (**Fluidextract of Gentian**). —**Dose**, 10 to 30 ♏ (0.60 to 2 c.c.).

**Tinctura Gentianæ Composita** (**Compound Tincture of Gentian**).—**Dose**, fl℥j to ij (4 to 8 c.c.).

**Action and Uses.**—Gentian is a simple bitter and promotes the salivary and gastric secretions as well as gastric peristalsis, improving the appetite and digestion. In *atonic* and *fermentative dyspepsia, gastric catarrh,* and *anorexia;* in the latter condition it is to be given about one-half hour before meals.

## GLANDULÆ THYROIDEÆ SICCÆ (DESICCATED THYROID GLANDS).

**Source.**—The thyroid glands of the sheep (*Ovis aries*), freed from fat, and cleaned, dried, and powdered.

**Form.**—A yellowish, amorphous powder, having a slight, peculiar odor. It is partly soluble in water. **Dose**, 1 to 10 grs. (0.06 to 0.60 gm.).

A liquid extract may be prepared by maceration of the fresh gland in glycerin and water for twenty-four hours and straining. Its dose is about the same as the desiccated gland. The dosage of thyroid and its preparations enjoys some latitude and must be graduated to suit individual cases.

The chief constituent of the gland is a body called *iodothyrine* (Baumann), which contains from 5 to 10 per cent. of iodine.

**Application.**—The action of thyroid is but little understood; certain circulatory symptoms show themselves after large dosage, but the symptoms are not constant. The effect of the drug on metabolism is marked. It increases the elimination of nitrogen in the urine and the total amount of $CO_2$ excreted by the lungs is also increased; in the increased oxidation, nitrogenous and non-nitrogenous materials alike undergo increased combustion. It causes a marked falling off in bodily weight. The amount of urine is also increased.

Overdoses cause a rapid, weak pulse, headache, nausea,

diarrhœa, tremor of the limbs, and occasionally delirium. The long-continued administration is followed by emaciation, weakness, alopecia, proptosis, and paresis. The drug may be administered by the mouth with good results; it was held at one time that its best effects followed the subcutaneous administration. It is used with good effect in *myxœdema*, *cachexia strumipriva*, in *sporadic cretinism*, and in *goitre*. It has been tried with little success in Graves' disease. It has also been used with some success in *psoriasis*. It may be tried in *eczema* and *lupus*.

## GLANDULÆ SUPRARENALES SICCÆ (DESICCATED SUPRARENAL GLANDS).

**Sources.**—The suprarenal glands of the sheep (*Ovis aries*) or ox (*Bos tauros*), freed from fat, and cleaned, dried and powdered.

**Form.**—A light yellowish-brown powder, amorphous, with a slight characteristic odor; partially soluble in water. One part of the desiccated glands represents approximately six parts of fresh glands, free from fat.

**Dose.**—2 to 10 grs. (0.12 to 0.60 gm.).

## SUPRARENAL (GLANDS).

**Sources.**—As ductless glands the suprarenal were long supposed to have some function in the body; their action was obscure until comparatively recently, when it was found that an extract of the medulla had certain effects on the animal organism. That the glands had an internal secretion was not doubted. Abel succeeded in isolating an active principle from the medulla of the gland which he named *epinephrin* and which has the same action as the medullary extract. It is alkaloidal in character and capable of forming salts with acids.

**Action.** *Locally.*—The aqueous extract of the dried gland causes on mucous membranes a blanching of the part due to constriction of the bloodvessels. For this reason it is used extensively in acute inflammations about the conjunctiva and the nasal mucous membrane; it has but little anæsthetic effect of its own. It is used as a hæmostatic, and has a distinct advantage over cocaine in that when applied to bleeding surfaces the vessels are constricted permanently, that is, there is not a recurrent hemorrhage, as is the case after the application of cocaine.

*Internally.*—Its action on the *circulation* is very much like that of digitalis. It differs from digitalis in the rapidity of its action, for its effects are noticed almost immediately and are over again in a comparatively short time. It causes an immense rise in blood pressure, due in part to action on the muscular coats of the arteries, to direct action on the heart muscle, and partly to stimulation of the vasomotor centre. Blood pressure falls because of vagus effect, which slows the heart. The short duration of its effects are thought to be due to the withdrawal of the drug from the circulation or to its destruction. Respiration is but little affected in small doses, while large doses increase and later depress them, finally paralyzing the respiratory centre. Its action on muscle resembles that of veratrine, but this is of little value in practice. Its action on the nervous system has been but little studied.

**Uses.**—As a *hæmostatic* it is used in rhinological practice. It is used in *conjunctival inflammations* of all sorts. Insufflated or the solution is very valuable in *hay fever*. Administered per *os* its effects are uncertain. *Impure* preparations on the market injected into the circulation or hypodermically are apt to cause collapse. The drug has been used by Osler with some success in *Addison's disease*, although others do not report favorably.

It has been used in *suppurative otitis* with *success* as it has been in all *congestive disturbances* of the middle ear. It is of value in *pharyngitis*.

## GLYCERINUM (GLYCERIN. GLYCEROL. PROPENYL HYDRATE).

**Form.**—A liquid obtained by the decomposition of fixed oils or vegetable or animal fats and containing not less than 95 per cent. of absolute glycerol, a triatomic alcohol. It is a thick, heavy, colorless, neutral liquid, odorless and having a sweet taste. It is **soluble** in water, alcohol and a mixture of ether (1), alcohol (3).

It has a great affinity for water and, if full strength, will absorb about 50 per cent. of its weight. From it, by the action of nitric and sulphuric acids, is obtained nitroglycerin. Care is to be exercised in bringing glycerin in contact with potassium permanganate, chromic acid, and chlorinated lime, as it is decomposed often with violence.

### The Official Preparations of Glycerin.

**Suppositoria Glycerini** (**Suppositories of Glycerin**).—Each suppository contains glycerin, 30 gm.; monohydrated sodium carbonate, 0.5 gm.; stearic acid, 2 gm.; water, 5 gm. Mix and effect a solution by means of heat; pour into 10 moulds and when cold wrap in tin-foil. Each contains 90 grs. (6 gm.) of glycerin. **Dose**, one as required.

**Action.**—*Externally* applied it causes a mild irritation and feeling of warmth. To broken skin it causes, even when diluted, a smarting and burning, with pain. When pure this is due to the abstraction of water from the tissues, but it must be remarked that by some glycerin cannot be borne at all even on a healthy skin, on account of the pain it causes. It is readily absorbed from the skin and rapidly diffuses.

*Internally.*—When swallowed there is a sensation of warmth in the mouth, throat, and stomach. It is readily absorbed from the alimentary canal and after moderate amounts

none appears in the urine; it is oxidized in the body and to a certain extent takes the place of food, while the total amount of energy is increased. After continuous administration bodily weight is increased, due to the increase of the non-nitrogenous elements in the body. Its oxidation does not in any way save the waste of nitrogenous tissue. For this reason it has its advocates in the treatment of diabetes.

Large doses cause purgation largely through irritation. Injected into the rectum or by means of its suppository it also causes purgation through irritation, although its extended use tends to render the lower bowel hypersensitive. Small doses as an enema cause a soft stool without pain and seldom more than one evacuation.

**Uses.**—Glycerin is used in skin diseases to soften hard crusts to permit their removal. In *chapped hands* or *excoriations, fissured nipples,* and *anal fissure* it is very useful. It is used on tampons and applied to the uterus in *endometritis* and *uterine congestion.* In *leucorrhœa* the glycerite of tannic acid is used in the same way. The glycerite is used in *pruritus* and in *itching* skin diseases, as *eczema.* Or glycerin may be used undiluted in *pruritus.* It is used in combination with other agents in *chronic nasal catarrh, chronic pharyngitis,* and *laryngitis.*

*Internally* it is used occasionally in *flatulent dyspepsia,* and it has its adherents in the treatment of *diabetes.* It is much used as an enema or suppository in *constipation.*

## GLYCYRRHIZA (LICORICE).

**Sources.**—The dried rhizome and root of *Glycyrrhiza glabra* (Spanish) or of *Glycyrrhiza glandulifera* (Russian). It contains a glucoside glycyrrhizin, which is a combination of glycyrrhizic acid and ammonium, and official as *Glycyrrhizinum ammoniatum.* It is not a very stable substance and exists in the form of dark-brown or brownish-red scales,

odorless, and of a very sweet taste. It is **soluble** in water and alcohol. **Dose,** 5 to 15 grs. (0.30 to 1 gm.).

### The Official Preparations of Licorice.

**Extractum Glycyrrhizæ** (**Extract of Glycyrrhiza**).—**Dose,** *ad libitum.*

**Extractum Glycyrrhizæ Purum** (**Pure Extract of Glycyrrhiza**).—**Dose,** *ad libitum.*

**Fluidextractum Glycyrrhizæ** (**Fluidextract of Glycyrrhiza**).—**Dose,** *ad libitum.*

**Mistura Glycyrrhizæ Composita** (**Compound Mixture of Glycyrrhiza. Brown Mixture**).—Contains pure extract of glycyrrhiza, 30; syrup, 50; acacia, 30; camphorated tincture of opium, 120; wine of antimony, 60; spirit of nitrous ether, 30; water, q. s. ad 1000. **Dose,** 1 to 4 fl3 (4 to 15 c.c.).

**Trochisci Glycyrrhizæ et Opii** (**Troches of Glycyrrhiza and Opium**).—Each contains 0.15 gm. extract of glycyrrhiza and 0.005 gm. ($\frac{1}{12}$ gr.) powdered opium. **Dose,** 1 to 2.

**Pulvis Glycyrrhiza Compositus** (**Compound Powder of Glycyrrhiza**). See Senna.

**Uses.**—Licorice is chiefly used as a *demulcent* in *sore throat, hoarseness,* and *bronchitis.* It is used at times in *genitourinary irritation.* The various preparations are used as vehicles and correctives, alone or combined with aromatics, to cover the taste of cascara, quinine, etc. It is to be remembered that licorice preparations are incompatible with the syrup of squills and all preparations containing acids.

## GUAIACUM (GUAIAC).

**Sources.**—The resin of the wood of *Guaiacum officinale* and of *Guaiacum sanctum.* Habitat, West Indies. It contains

several resinous acids, as *guaiaconic acid*, 70 per cent.; *guaiac acid*, *guaiarec acid*, and others.

### The Official Preparations of Guaiacum.

**Tinctura Guaiaci** (**Tincture of Guaiac**).—**Dose**, 30 to 60 ♏ (2 to 4 c.c.).

**Tinctura Guaiaci Ammoniata** (**Ammoniated Tincture of Guaiac**).—**Dose**, 30 to 60 ♏ (2 to 4 c.c.).

**Action and Uses.**—*Locally* guaiac is mildly antiseptic and astringent; the tinctures are used either applied or as gargles, in *follicular tonsillitis*, *pharyngitis*, and *quinsy*. Troches of guaiac are much used in *relaxed conditions* of the throat.

*Internally.*—Small doses increase the salivary, gastric, and intestinal secretions; large doses cause gastroenteritis. The drug is used as an alterative in *chronic muscular rheumatism*, *lumbago*, and *gout*.

## GUAIACOL (GUAIACOL).

**Sources.**—One of the chief constituents of creosote, the product from beech-wood tar obtained by collecting and purifying the fraction of creosote boiling between 200° and 205° C. (392° and 401° F.); or prepared synthetically from either catechol by methylating or from orthoanisidin or by diazotizing and boiling. Guaiacol should be preserved in amber colored bottles protected from light. Guaiacol was originally obtained by the destructive distillation of guaiac wood. It constitutes from 60 to 90 per cent. of creosote.

**Form.**—A colorless crystalline solid melting at 28.5° C. (83.3° F.) or a colorless, refractive liquid with an aromatic odor and an agreeable taste. Is *insoluble* in water, *soluble* in alcohol. Chemically it is *methyl pyrocatechin*.

**Uses.**—Guaiacol enjoys a reputation as an intestinal

antiseptic; salts, as the benzoate and carbonate, are particularly lauded on account of being tasteless and less liable to derange digestion. Guaiacol is used as an antipyretic. *Locally* it has been used in *tonsillitis*. It and its salts are used in the treatment of *phthisis*, but have no advantage over creosote. **Dose**, 2 to 10 ♏ (0.12 to 0.60 c.c.).

The official preparations of Guaiacol are **Guaiacolis Carbonas** (**Guaiacol Carbonate**).—A guaiacol derivative obtained by the action of carbonyl chloride upon sodium-guaiacolate. Exists as a white crystalline powder, neutral in reaction, almost tasteless and odorless. Is *insoluble* in water; *soluble* in 48 parts of alcohol at 25° C. **Dose**, 5 to 30 grs. (0.30 to 2 gm.).

It is used internally for the same conditions as are guaiacol and creosote. Its chief advantage lies in its insolubility and consequent tastelessness.

## HYDRARGYRUM (MERCURY).

*Metallic mercury* is not used in therapeutics to-day, although it was used at one time in constipation and intestinal obstruction, in either case acting by its weight.

### The Official Preparations of Hydrargyrum.

**Massa Hydrargyri** (**Blue Mass**).—**Dose**, as a laxative 1 to 15 grs. (0.06 to 1 gm.); as an antisyphilitic or alterative, ½ to 3 grs. (0.03 to 0.18 gm.).

**Unguentum Hydrargyri** (**Mercurial Ointment**).—Fifty per cent. mercury. Is **used**, *externally*, as an inunction in *syphilis* and *pediculosis*, to promote absorption in *glandular swellings*, as *orchitis*, *epididymitis*, *goitre*, etc.

**Unguentum Hydrargyri Dilutum** (**Blue Ointment**).—One-third mercury. Used in a similar manner.

**Emplastrum Hydrargyri** (**Mercurial Plaster**).—It may be used instead of the ointment in *syphilis* and as application to *chancres.*

**Hydrargyrum Ammoniatum** (**Ammoniated Mercury. Mercuric Ammonium Chloride**).—It is used externally in the—

**Unguentum Hydrargyri Ammoniati.**—Contains 10 per cent. It is used in *pediculosis* and *parasitic* skin diseases.

**Hydrargyrum cum Creta** (**Mercury with Chalk. Gray Powder**).—Contains 38 parts of mercury, with sugar of milk and prepared chalk. Is used in syphilis as an alterative; also as a laxative. **Dose**, $\frac{1}{2}$ to 10 grs. (0.03 to 0.60 gm.).

**Hydrargyri Oxidum Rubrum,** used only in *Unguentum Hydrargyri Oxidi Rubri* (*Red Precipitate Ointment*). Contains 10 per cent.

**Hydrargyri Oxidum Flavum,** used only in the *Unguentum Hydrargyri Oxidi Flavi* (*Yellow Precipitate Ointment*). Contains 10 per cent.

Of the last two ointments, the red is the more irritating; both are used as applications to *chancres* and *condylomata;* also in *granular conjunctivitis* and *corneal ulcers.*

**Oleatum Hydrargyri** (**Oleate of Mercury**).—Is used as an inunction in *syphilis* but requires dilution as it is too irritating.

**Hydrargyrum Chloridum Mite** (**Mercurous Chloride. Calomel**).—**Dose**, $\frac{1}{2}$ to 5 grs. (0.03 to 0.30 gm.). Is used as a *purgative;* as an *antisyphilitic* by *fumigation;* is used as a dusting powder in various *skin diseases* and in *pruritus;* in small doses 0.006 it is used to check *vomiting* in acute gastritis.

**Hydrargyrum Chloridum Corrosivum** (**Mercuric Chloride. Corrosive Sublimate**).—**Dose**, $\frac{1}{60}$ to $\frac{1}{10}$ gr. (0.001 to 0.006 gm.). Is used in *syphilis* and as an *alterative;* in aqueous solution (1 to 1000) as an *antiseptic* and *parasiticide.* It is generally used with *citric acid* to avoid combination with albumin, which is insoluble and inert.

**Hydrargyri Iodidum Flavum** (**Mercurous Iodide. Yellow Iodide of Mercury**).—**Dose**, $\frac{1}{6}$ to 1 gr. (0.01 to 0.06 gm.), as an *antisyphilitic.*

**Hydrargyri Iodidum Rubrum** (**Mercuric Iodide. Red Iodide**).—**Dose**, $\frac{1}{60}$ to $\frac{1}{10}$ gr. (0.001 to 0.006 gm.). Is much **used** in *tertiary syphilis* either alone or with potassium iodide; or corrosive sublimate is prescribed with potassium iodide; the iodide of mercury is formed and kept in solution by the excess of iodide.

**Unguentum Hydrargyri Nitratis** (**Citrine Ointment**).—Is **used** in *syphilitic ulcers, pediculosis,* and other *parasitic* skin diseases.

**Liquor Hydrargyri Nitratis** (**Solution of Mercuric Nitrate**).—Is **used** as an *escharotic.*

**Incompatibility.** Metallic preparations and calomel are incompatible with hydrochloric acid and chlorides, corrosive sublimate being formed. In general, corrosive sublimate is incompatible with every other medical substance.

**Action.** *Externally.*—Most of the preparations of mercury are antiseptic and parasitic, corrosive sublimate ranking the highest. The mercuric salts are powerful irritants, the mercurous being less so; mercuric nitrate is very caustic. All forms of mercury are readily absorbed from all surfaces no matter how applied.

*Internally.*—Taken into the stomach all preparations are converted into the albuminate, which remains in solution in the presence of sodium chloride; it is absorbed as the albuminate and circulates as such. All preparations of mercury are alterative, but the insoluble ones are purgative, their action being confined to the duodenum and jejunum. They are not cholagogues but they do aid in excretion of bile. Corrosive sublimate and calomel are diuretic, but whether their action is due to stimulation of the renal epithelium, or to increasing the amount of urea which is a diuretic, remains to be demonstrated. Mercury is **eliminated** by the sweat, saliva, bile, urine, and milk.

**Chronic poisoning** may be seen from over-dosage or where idiosyncrasy exists. The first symptom noticed is a fetor of the breath, soreness of the gums, metallic taste in the mouth, salivation, and if the cause be not withdrawn, ulceration of the gums, loosening of the teeth, necrosis of the alveolar process, tremors, and marasmus. Salivation is more easily caused by calomel and blue mass than by corrosive sublimate or mercury with chalk.

**Treatment** consists of the withdrawal of the drug, or if due to occupation, withdrawal from it; various remedial measures may be employed: potassium iodide, free catharsis, baths, and other hygienic measures.

**Uses** were mentioned after each preparation.

**Application.**—The drug may be administered by *inunction* applying to inner surfaces of the thighs and arms, groin, abdomen, to each in succession daily. By *fumigation;* calomel is used, placed in a dish over a small flame, under the patient on a chair and covered with a blanket. *Hypodermically;* corrosive sublimate is preferred in $\frac{1}{8}$ gr. (0.008 gm.) doses, dissolved in distilled water, or the insoluble compounds like calomel are suspended in liquid petrolatum or in salt solution and injected deep into the muscles like the gluteal on the outer side.

## HYDRASTIS (GOLDEN SEAL).

**Sources.**—The dried rhizome and roots of *Hydrastis canadensis,* yielding when assayed not less than 2.5 per cent. of hydrastine. Habitat, North America. They **contain** *hydrastine,* a colorless, slightly acrid alkaloid freely **soluble** in water, alcohol and ether; *berberine,* a yellow, very bitter alkaloid common to many plants, and *canadine,* an alkaloid present in very small amounts.

**The Official Preparations of Hydrastis.**

**Fluidextractum Hydrastis** (**Fluidextract of Hydrastis**).—Is **miscible** with water or alcohol. **Dose**, 5 to 60 ♏ (0.30 to 4 c.c.).

**Glyceritum Hydrastis** (**Glycerite of Hydrastis**).—A fluidextract with glycerin and water as a menstruum. May be **used** as an injection or internally. **Dose**, 5 to 60 ♏ (0.30 to 4 c.c.).

**Tinctura Hydrastis** (**Tincture of Hydrastis**).—**Dose**, ℥ss to 2 (2 to 8 c.c.).

**Hydrastine.**—The alkaloid of hydrastis. **Dose**, ½ to 1 gr. (0.03 to 0.06 gm.).

**Hydrastininæ Hydrochloras.**—The hydrochlorate of the artificial alkaloid obtained from hydrastine by oxidation. **Soluble** in water and alcohol. **Dose**, $\frac{1}{12}$ to 1 gr. (0.005 to 0.006 gm.).

**Action.**—The chief effects of hydrastis are on the central nervous system where the first results are a stimulation of the medulla which involves the respiratory centre causing accelerated respiration, stimulation of the vagus centre causing a slowing of the heart, and stimulation of the vasomotor centre causing a rise in blood pressure through arteriolar constriction, which it is argued is also due to a local effect on the arterioles. Large doses stimulate the cord, which is later followed by depression and paralysis of the medulla and the cord. Large doses cause a paralysis of the heart muscle. It is claimed that hydrastis causes uterine contractions; clinically this does not seem to be borne out; if it has any action on the uterus it at best is feeble.

Hydrastinine is advocated in uterine hemorrhages on account of its constricting effect on the arterioles; its effects on uterine arterioles are no greater than elsewhere in the body, since the circulatory effects differ in no way from those produced by hydrastis.

**Uses.**—Hydrastis is not used to any extent in those cases

in which its action would warrant; it is used most largely in affections of the mucous membranes where its use is empiric. *Externally* it is used as an injection in *gonorrhœa* and *leucorrhœa;* as a wash for *sore mouths* and *ulcers* generally. *Internally* it is used to promote appetite and digestion, in *atonic dyspepsia* and *gastric catarrh.* It is used in *catarrhal jaundice,* in *chronic cystitis,* and as a *diuretic* in *interstitial nephritis.* Hydrastinine has been used in *uterine hemorrhages.*

## ICHTHYOL.

**Sources.**—Ichthyol is obtained by distilling a bituminous mineral found in Tyrol containing fossil fish. On treating this substance with sulphuric acid, ichthyo-sulphonic acid is formed. This unites readily with bases and the substance in common use is the ammonium salt. It occurs as a dark-brown, viscid liquid with a bituminous odor and taste. It is **soluble** in water and alcohol; it is miscible with glycerin. It **contains** about 10 per cent. of sulphur, but its exact chemical composition is not known. **Dose,** 2 to 10 ♏ (0.12 to 0.60 c.c.).

**Uses.**—It is used in *various skin diseases* as *eczema* of an *erythematous type,* in *acne rosacea, lupus,* and *erysipelas.* It is also used in the form of an ointment on *inflamed* and *rheumatic* joints; in *inflammatory conditions* of the *uterus, ear,* and *nose.* It may be used full strength or diluted with petrolatum, glycerin, or a mixture of alcohol and ether. It is not used to any extent internally and when so, as an alterative.

## IODUM (IODINE).

**Source.**—Obtained from the ashes of sea weeds and from the mother-liquor of Chili saltpetre.

**Form.**—Heavy, bluish-black, dry, and friable rhombic plates, having a metallic lustre, a distinctive odor, and a

sharp, metallic taste. It is **soluble** in 5000 parts of water; 10 of alcohol, freely in ether and in solutions of KI or NaCl.

It is **incompatible** with metallic salts, mineral acids, alkaloids, oil of turpentine, and ammonia; the last two are liable to form explosive compounds.

### The Official Preparations of Iodine.

**Tinctura Iodi** (**Tincture of Iodine**).—Seven per cent. **Dose**, 1 to 10 ♏ (0.06 to 0.60 c.c.).

**Liquor Iodi Compositus** (**Compound Solution of Iodine**).—Contains 5 per cent. dissolved in 10 per cent. KI solution. **Dose**, 1 to 10 ♏ (0.06 to 0.60 c.c.).

**Unguentum Iodi** (**Iodine Ointment**).—Four per cent.

**Action.**—Iodine itself is not used in medicine but when any of its preparations are brought into contact with the skin, it stains a yellow or dark-brown color; at the same time there is a sensation of heat and smarting. The superficial cuticle is destroyed and in time peels off. Concentrated, its action is prolonged, and vesication and corrosion follow. On mucous membranes its action is even more irritating; inhaled, the vapor causes various grades of irritation according to concentration. In the intestinal tract the same applies, large amounts causing violent gastroenteritis, collapse, failure of respiration and the heart. It is absorbed as the iodide, iodate, or possibly the albuminate; it is excreted chiefly by the kidneys as the iodide; the saliva, milk, perspiration, and the secretion of the respiratory tract eliminate it. In **acute poisoning by iodine** the antidote is *starch*, which should be given at once (iodized starch which is formed is innocuous), and followed by emetics.

**Uses.**—Iodine has been largely superseded in internal medicine by the iodides. Externally it may be used as a *counterirritant* and *resolvent*. The tincture may be applied to joints, as in *synovitis*, *rheumatism*, and *gout*. Also in *pleurisy* to abort, or promote absorption of fluid. In *gland-*

*ular swellings* of all kinds, in skin diseases, as *lupus, tinea tonsurans, chloasma,* and in *chronic hepatic* and *splenic* disease its external application is very useful. In *coryza, endometritis,* and *endocervicitis* its application in dilute solution is beneficial.

## IODIDES.

**Potassii Iodidum.**—**Dose,** 2 to 30 grs. (0.12 to 2 gm.).
**Sodii Iodidum.**—**Dose,** 2 to 30 grs. (0.12 to 2 gm.).
**Ammonii Iodidum.**—**Dose,** 2 to 20 grs. (0.12 to 1.20 gm.).
**Strontii Iodidum.**—**Dose,** 2 to 30 grs. (0.12 to 2 gm.).
**Syrupus Acidi Hydriodici.**—**Dose,** fℨj (4 c.c.). Contains about 1 per cent. of HI.

**Characters.**—The iodides form colorless crystals with a bitter saline taste; they are **soluble** in water and less so in alcohol. Usually they are prescribed alone on account of the readiness with which they are decomposed. They are **incompatible** with mineral acids and acid salts, alkaloids, bismuth subnitrate, soluble lead salts, and spirit of nitrous ether.

**Action.**—*Locally* they have no action. *Internally* large doses cause a gastroenteritis of a more or less severe form. The iodides are readily absorbed and eliminated by all paths of elimination. After long-continued administration or where an idiosyncrasy exists iodine and iodides develop a line of symptoms, **iodism,** in which there are *coryza, lachrymation, frontal headache, salivation, sore throat, dyspnœa, dysphagia,* and various forms of *skin eruptions* on the head, neck, and shoulders. The urine is increased; respiration and circulation are little affected.

The various symptoms of iodism are supposed to be due to the decomposition of the iodides in the body and the consequent liberation of the iodine at the various points. At times there are unusual symptoms seen, as emaciation, weakness, mental confusion, and restlessness. The treat-

ment of chronic poisoning from iodides is mainly along hygienic lines; baths for the eruptions; the simultaneous administration of alkalies, as bicarbonates, prevent to an extent the occurrence, and the same measures may be employed later.

**Uses.**—*Tertiary syphilis* and its many results are best treated by iodides. *Spasmodic asthma, catarrhal pneumonia, bronchitis,* either *chronic* or *capillary; scrofula* in its various manifestations are best treated with iodides; in *hepatic cirrhosis* in its first stage; in *chronic interstitial nephritis,* in *chronic rheumatism* and in *gout* it is a very useful remedy. In *chronic poisoning* by metals as *lead* and *mercury,* the iodides aid in their elimination. It is very useful in *duodenal catarrh*; also in the *vomiting* of *pregnancy.* They may be used in *acute nasal catarrh* and *hay fever.*

## IODOFORMUM (IODOFORM).

**Form.**—Small lemon-yellow crystals, with an insuppressible, saffron-like odor and an unpleasant, iodine-like taste. It **contains** 96.7 per cent. of iodine, is **insoluble** in water, but imparts an odor to it; is **soluble** in 52 parts of alcohol and 5.2 parts of ether; freely in fixed and volatile oils. To disguise its odor balsam of Peru, oil of bitter almonds, or thymol are useful.

**Symptoms.**—Clinically it is stated to be an antiseptic and to favor asepsis. When applied in large amounts to open surfaces it is absorbed and complex symptoms arise which indicate that it is broken up in the tissues and the various effects of iodine and iodides are seen, such as anxiety, restlessness, discomfort, and headache; depression follows with cerebral symptoms, as melancholia and hallucinations, delirium, and even mania; in fatal cases followed by collapse and death. The value of iodoform as a dressing seems to depend upon its decomposition by the tissues and the liberation of iodine.

**Uses.**—*Internally* it is not used extensively; it may be tried as an *intestinal antiseptic*, in *diabetes* and *syphilis;* it may be inhaled from solution in *tuberculosis*. *Externally* its *chief value* is as a *dressing* and as such it is very efficacious in *checking secretion* from wounds and *promoting* the *growth* of granulation tissue, whatever *its effects* may be as an antiseptic. It may be applied as a powder in *abscess cavities* and *wounds* of all descriptions; used on gauze or as an ointment as indicated. The disagreeable odor of iodoform and also its toxicity caused the introduction of many substitutes of more or less value.

**Iodolum** (**Iodol**).—Contains 90 per cent. of iodine, is odorless and tasteless. It has the same action as iodoform.

**Thymolis Iodidum** (**Thymol Iodide. Aristol**).—Contains 46 per cent. of iodine. It is dithymol diiodide; it is odorless and has many advantages.

## IPECACUANHA (IPECAC).

**Source.**—The dried root of *Cephaelis ipecacuanha* (Rio), and *Cephaelis acuminata* (Carthagena), small shrubby plants of Brazil and Central America, yielding on assay not less than 2 per cent. of ipecac alkaloids. It contains two alkaloids, *emetine* and *cephaeline*, which resemble each other in their action.

### The Official Preparations of Ipecac.

**Fluidextractum Ipecacuanhæ** (**Fluidextract of Ipecac**).—**Dose**, 1 to 5 ♏ (0.06 to 0.30 c.c.), as an *expectorant*; 15 to 30 ♏ (1 to 2 c.c.), as an *emetic*.

**Syrupus Ipecacuanhæ** (**Syrup of Ipecac**)
**Vinum Ipecacuanhæ** (**Wine of Ipecac**) } **Dose**, 2 to 15 ♏ (0.12 to 1 c.c.), as an *expectorant;* ½ to 1 ℥ (2 to 4 c.c.), as an *emetic*.

**Pulvis Ipecacuanhæ et Opii (Powder of Ipecac and Opium. Dover's Powder).**—Contains 10 per cent. of each. **Dose,** 1 to 10 grs. (0.06 to 0.60 gm.). Diaphoretic and anodyne.

**Tinctura Ipecacuanhæ et Opii (Tincture of Ipecac and Opium).**—Contains 10 per cent. of each. **Dose,** 5 to 15 ♏ (0.30 to 1 c.c.). Diaphoretic and anodyne.

**Action.**—*Locally* ipecac is very irritating to the unbroken skin and causes redness, vesicles, and even pustules. *Internally* the irritative action of the drug is shown by nausea and vomiting, with depression and muscular weakness, increased secretion by the salivary glands as well as those of the trachea and bronchi. The same result follows the subcutaneous or intravenous administration of emetine. The vomiting seen is due to local irritation of the gastric mucous membrane and, perhaps, to an excitation of the centres in the medulla which control vomiting; the latter is, however, disputed because many irritants cause vomiting when injected subcutaneously; explained by the fact that elimination takes place through the gastric mucosa with consequent irritation. Ipecac has a direct depressing action on all muscle tissue and large amounts have a depressing effect on the heart muscle.

**Uses.**—It is a slow, not very depressing emetic and may be used to produce emesis in *acute indigestion, atonic dyspepsia* with *flatulence, bilious headache,* etc.; also in *croup, laryngismus stridulus, capillary bronchitis,* and *tracheitis.* It is particularly valuable as an *expectorant,* since it tends to *liquefy* secretions. It may be used to check *reflex vomiting,* as that of pregnancy; also in the *diarrhœas* of infancy and in *dysentery.* It is frequently combined with cathartics because of its reputed cholagogue action, which, however, has not as yet been proved.

## JALAPA (JALAP).

**Source.**—The dried tuberous root of *Exogonium purga*, a plant of Mexico, yielding on assay not less than 8 per cent. of total resin, but not less than 1.5 per cent. of resin, soluble in ether. It **contains** two resinous bodies (anhydrides), *convolvulin* (active) and *jalapin* (inactive).

### The Official Preparations of Jalap.

**Resina Jalapæ (Resin of Jalap).**—**Dose**, 1 to 5 grs. (0.06 to 0.30 gm.).

**Pulvis Jalapæ Compositus (Compound Jalap Powder).**—Contains jalap 35 and potassium bitartrate 65 parts. **Dose**, $3\frac{1}{4}$ to 1 (1 to 4 gm.).

**Uses.**—Jalap acts as an irritant to the intestinal tract and produces watery stools. A hydragogue cathartic. Large doses are very apt to cause enteritis. It is used for the purpose of removing large amounts of fluid, as in *dropsies* of renal or cardiac origin or as a *cerebral* revulsant.

## KINO.

**Source.**—The inspissated juice of *Pterocarpus marsupium*, a tree of Bengal. It **occurs** in the form of small, dark-brown, red, shining pieces, odorless and with a sweetish astringent taste. It **contains** 75 per cent. of *kinotannic acid*, to which its effects are due.

### The Official Preparation of Kino.

**Tinctura Kino.**—**Dose**, $f\mathfrak{z}\frac{1}{4}$ to 2 (1 to 8 c.c.).

**Uses.**—A favorite remedy in the *summer diarrhœas* of children and *serous diarrhœas*. Its usefulness depends on its contained tannic acid, which acts as an astringent. It

should be preceded by a purge, when its effects are more beneficial.

## LIMONUM (LEMON).

### Limonis Cortex (Lemon Peel).

**Sources.**—The recently separated outer rind of the fruit of *Citrus limonum.* Habitat, Northern India, but cultivated in most subtropical countries. It **contains** a bitter principle, *hisperidin,* in the white portion of the rind, while in the outer yellow is a volatile oil, the—

**Oleum Limonis,** which is obtained by expression from the fresh peel. About 90 per cent. of it is composed of *limonene,* a terpene; also present are orange *citral* and *citronelal,* both aldehydes. The oil is not very stable, the limonene soon oxidizes, and the oil acquires a terebinthinate odor and taste. The oil enters, as also does the peel, into

#### The Official Preparations of Limonis Cortex.

**Tinctura Limonis Corticis (Tincture of Lemon Peel).**—**Dose,** ʒss to ij (2 to 8 c.c.).

**Tincture of Lemon Peel** enters into *syrupus acidi citrici* or syrup of citric acid.

**Uses.**—Lemon is largely used as a flavor and vehicle.

### Limonis Succus (Lemon Juice).

**Sources.**—The freshly prepared juice of the fruit of *Citrus limonum.* It **contains** about 6 per cent. of citric acid, part of which is in combination with potassium and other bases; phosphoric and malic acids are also present. Its **action** and **uses** are those of citric acid.

## LINUM (LINSEED. FLAXSEED).

**Sources.**—The ripe seed of *Linum usitatissimum.* Habitat, the Levant and Southern Europe, but cultivated in

most temperate countries. It **contains** from 30 to 35 per cent. of fixed oil in its parenchyma and about 15 per cent. of mucilage in the epithelium. It also contains a certain amount of proteid matter.

**Oleum Lini** (**Linseed Oil**).—A fixed oil expressed from linseed. Linseed oil which has been "boiled" should not be used or dispensed. It contains linolein, palmitin, and small amounts of stearin. The hardening properties are due to the oxidation of linolein to linoxyn, in which process linolein loses its glycerin. Linolein is composed of linoleic acid and glycerin, just as palmitin is composed of palmitic acid and glycerin, and stearin of stearic acid and glycerin.

**Linimentum Calcis** contains equal parts of linseed oil and lime water. It is used in *burns* as a dressing.

**Uses.**—Flaxseed is used as a *tea* or infusion in *bronchial catarrh;* in *renal, vesical,* or *urethral* inflammations, as well as *enteric disturbances,* as *dysentery,* etc. Flaxseed (ground) is used to make poultices. The oil is *laxative* and may be used as such.

## LITHIUM AND ITS PREPARATIONS.

Lithium in its **action** resembles the alkalies; lithium carbonate and citrate resemble the corresponding potassium salts. The bromide, benzoate, and salicylate have the properties of the bromides, benzoates, and salicylates of the alkaline metals.

**Lithii Benzoas.**—**Dose,** 5 to 30 grs. (0.30 to 2 gm.).
**Lithii Bromidum.**—**Dose,** 15 to 30 grs. (1 to 2 gm.).
**Lithii Carbonas.**—**Dose,** 2 to 15 grs. (0.12 to 1 gm.).
**Lithii Citras.**—**Dose,** 2 to 15 grs. (0.12 to 1 gm.).
**Lithii Citras Effervescens.**—**Dose,** ʒj to ʒij (4 to 8 gm.).
**Lithii Salicylas.**—**Dose,** 1 to 15 grs. (0.06 to 1 gm.).

## MAGNESIUM AND ITS PREPARATIONS.

**Magnesii Oxidum** (**Magnesium Oxide. Magnesia. Light Magnesia**).—Made by calcining the light carbonate of magnesium. Is a fine, white, light powder, odorless and having an earthy taste. Almost **insoluble** in water; after standing with water it gelatinizes, forming the hydroxide.

**Magnesii Oxidum Ponderosum** (**Heavy Magnesium Oxide. Heavy Magnesia**).—Made by rubbing light magnesia with alcohol or by calcining the heavy carbonate. Is a fine, white, dense, odorless powder with an earthy taste. Almost **insoluble** in water. Does not form the gelatinous hydroxide readily with water.

**Magnesii Carbonas.**—Made by mixing strong boiling solutions of magnesium sulphate and sodium carbonate; is a fine, white, light powder, odorless and an earthy taste. Almost **insoluble** in water.

**Magnesii Citras Effervescens.**—Is made by mixing the carbonate with citric acid and sodium bicarbonate. **Dose**, ʒ¼ to j (8 to 30 gm.).

**Liquor Magnesii Citratis.**—**Dose**, fl ʒ 2 to 8 (60 to 250 c.c.).

**Magnesii Sulphas** (**Epsom Salts**).—Small, colorless, rhombic prisms or acicular crystals with a very bitter taste; soluble in 1.5 parts of water. **Dose**, ʒ¼ to j (8 to 30 gm.). It resembles zinc sulphate very much, but differs in taste, the latter being metallic.

**Magnesii Sulphas Effervescens** (**Effervescent Magnesium Sulphate**).—Made by the addition of sodium bicarbonate, tartaric and citric acids. Its dose and action are the same. Its effervescent properties render it more pleasant.

**Action.**—Magnesia both light and heavy, as well as the carbonate, are *antacids*, being weak alkalies. They are also *mild laxatives*, but accumulate and form concretions in the intestines; their action is enhanced and the latter prevented

by acids, as citric or tartaric. They may be used as antidotes, since they form insoluble compounds with oxalic acid, mercury, arsenic, etc. The sulphate is an ideal saline purgative and is best given in *hot saturated solution*, when it greatly increases the secretion of intestinal fluid, which in turn excites peristalsis.

**Uses.**—Epsom salts may be used as a purgative to remove *fecal accumulations*, to remove fluid, as in *dropsical effusions*, also as depletant in *acute dysentery;* combined with dilute sulphuric acid in the treatment of *chronic lead poisoning* it is very good.

## MENTHA PIPERITA (PEPPERMINT).

**Sources.**—The dried leaves and flowering tops of *Mentha piperita*, a plant indigenous to Great Britain but cultivated widely. It **contains** a volatile oil, the *oleum menthæ piperitæ*, obtained by distillation. It is familiar. Its active constituent is—

**Menthol,** a stearopten having the character of a secondary alcohol and obtained from the oil of *Mentha piperita*, or from the Japanese or Chinese oil. It exists in the **form** of colorless, acicular crystals, with the odor of the oil and a warm, aromatic taste, followed by a cooling sensation when air is inhaled. It is but slightly **soluble** in water, freely in alcohol, ether, chloroform, oils, and glacial acetic acid. **Dose** of the **oil** and **menthol**, 1 to 5 grs. (0.06 to 0.30 gm.).

**Uses.**—The uses of both are the same. They are *antiseptic, analgesic, antipruritic,* and *anæsthetic.* In the form of an ointment they may be applied to *boils* and *inflammations.* Mixed with a bland oil they form valuable sprays for the nose and throat, as *rhinitis* and *pharyngitis.* Menthol is useful in *pruritus, eczema, urticaria,* etc. Internally they may be used as *antispasmodics, carminatives, antifermentatives,* and *stimulants.*

## NAPHTHALENUM (NAPHTHALENE).

Naphthalene is a hydrocarbon ($C_{10}H_8$) **obtained** from coal-tar. Is in the form of colorless, shining crystals, has an odor resembling that of coal-tar, is volatile and has a burning, aromatic taste. Is **insoluble** in water, **soluble** in alcohol, ether, oils, and chloroform. **Dose**, 1 to 15 grs. (0.06 to 1 gm.).

**Betanaphtol** ($C_{10}H_7OH$) is a phenol **obtained** from naphthalin by heating with sulphuric acid. It is one of several naphtols. Is in the **form** of whitish or buff-colored crystalline powder, with a faint phenol-like odor and a pungent taste. It is **soluble** in 1000 parts of water and a good antiseptic at this strength. **Dose**, 1 to 5 grs. (0.06 to 0.30 gm.).

**Uses.**—Naphthalene is a valuable antiseptic in diseases of the intestine due to *fermentation* and *putrefaction*, also in *typhoid;* it is absorbed into the circulation and is eliminated by lungs and kidneys; it has been used in *pyelitis*, *cystitis*, and in *fetid bronchitis* and *bronchorrhœa*. Naphtol is more active and its uses are similar. It is very useful in *gastric* and *intestinal fermentation*, *putrefaction*, etc. It has been used as a vapor from solution in *laryngeal phthisis*, but is very irritating. Both have been used in *parasitic skin diseases*, as dressings for *wounds*, etc.

## NITROUS OXIDE (LAUGHING GAS).

**Character.**—A colorless gas, with a very slight, agreeable odor and a sweetish taste. It is not inflammable but is a supporter of combustion. By pressure and cold it is converted into a thin, colorless liquid or even colorless crystals.

**Action.**—Inhaled the symptoms first seen are those of excitement, with laughter, inco-ordinate movements, followed by loss of sensibility to pain. The entire length of time

necessary as a rule for anæsthesia is from one-half to three minutes and its effects are over in a few minutes.

If the undiluted gas is used anæsthesia passes into asphyxia with unconsciousness, dyspnœic respiration, convulsions, and death, partly from paralysis of the respiratory centre, and in part from asphyxia, the result of the exclusion of oxygen. Its effects on the brain and cord are primarily those of stimulation, which is followed by depression. There is little direct effect on the circulation aside from a very transient stimulation of the vasomotor centre, which causes a rise in blood pressure which falls from depression of the vasomotor centre. The heart is but little affected and that chiefly as the result of the exclusion of oxygen, which slows it. There is no effect on the blood and the oxide circulates as such in solution in the blood, the corpuscular elements being unaffected.

**Administration.**—It is usually administered by means of a mask which covers both nose and mouth. The mask is connected by means of a rubber tube with a rubber bag, which in turn is connected with a tank containing the gas. The mask is usually equipped with two valves to allow the expired air to escape. In administering it is given until the face becomes cyanosed, when anæsthesia is usually complete, and short operations, such as the extraction of teeth, etc., may be accomplished. The process may be repeated, but when any length of time is required for the operation, so as to necessitate repetition, it is better to substitute ether.

Nitrous oxide is used to begin ether anæsthesia in that the preliminary stage of excitement is much less marked, and ether substituted for it later.

## NUX VOMICA.

**Sources.**—The dried ripe seed of *Strychnos nux vomica*, yielding on assay (U. S. P.) not less than 1.25 per cent.

of strychnine. The seed contains two alkaloids, *strychnine* and *brucine*, whose actions are very nearly alike, but the latter is weaker. They exist in combination with *igasuric acid*.

**The Official Preparations of Nux Vomica.**

**Extractum Nucis Vomicæ** (**Extract of Nux Vomica**).—**Dose**, $\frac{1}{8}$ to 1 gr. (0.0075 to 0.06 gm.).

**Fluidextractum Nucis Vomicæ** (**Fluidextract of Nux Vomica**).—**Dose**, 1 to 4 ♏ (0.06 to 0.25 c.c.).

**Tinctura Nucis Vomicæ** (**Tincture of Nux Vomica**).—**Dose**, 5 to 15 ♏ (0.30 to 1 c.c.).

**Strychnina** is preferably used as the **Strychninæ Sulphas**, which is **soluble** in 31 parts of water at 25° C. and contains 75 per cent. of strychnine. **Dose**, $\frac{1}{60}$ to $\frac{1}{20}$ gr. (0.001 to 0.003 gm.), or the **Strychninæ Nitras** which is **soluble** in 42 parts of water at 25° C. Its dose is the same as the sulphate.

**Symptoms.**—The first symptom of the physiological action of strychnine is a feeling of restlessness; if the drug be withdrawn usually no other symptoms occur; continued, or after very large doses, this first symptom is followed by trembling of the limbs; muscular twitchings ensue, with startings and a stiffness of the neck muscles; clonic convulsions suddenly appear, of varying intensity, during which the mind is clear and the perceptions more acute. During convulsions the face is contorted into the "*risus sardonicus*," and the body is in *opisthotonos* usually.

**Action.**—In *medicinal doses* strychnine increases the motility of the stomach; gastric and intestinal secretions are increased through its effect as a simple bitter.

*Nervous System.*—The cerebrum is but slightly affected, motor areas being stimulated if influenced, as are the special senses of sight, hearing, smell, and particularly touch. In the medulla the respiratory, vagus, and vasomotor centres are at first stimulated, with respirations increased, heart slowed, and blood pressure raised; the effects are transient,

however, for either the centres tire or the effects are obscured by interfering convulsions; later they become paralyzed. Convulsions seen are spinal in their origin and always maximal, regardless of the strength of the stimuli. The exact seat of action in the cord remains unproved; that there is a lessened resistance to the passage of impulses at certain points between the cells of the anterior and posterior horns seems obvious.

*Respiratory System.*—Owing to the fact that the respiratory centre is stimulated, the respirations are quicker and deeper. The muscles of respiration are involved in the general convulsion and breathing is greatly interrupted; this may be so severe that the patient may become asphyxiated. The chief cause of death is paralysis of the respiratory centre.

*Circulation.*—There is practically no effect upon the heart, and any circulatory effects seen are due to stimulation of the vasomotor centre and a consequent rise in blood pressure. During a convulsion blood pressure is markedly raised and the heart at times accelerated, due to the exertion. Strychnine is quickly absorbed and its effects become apparent within a half-hour. It increases metabolism and is chiefly eliminated by the urine.

The **treatment of poisoning** consists in evacuation of the stomach if seen early enough; tannic acid is the chemical antidote, while chloral and potassium bromide are the physiological antidotes; ether or chloroform may be administered to control the convulsions. Catheterization of the bladder may be employed to prevent resorption.

**Uses.**—There is no better remedy than the tincture in *atonic dyspepsia*, also in the *gastric catarrh* of drunkards; in *habitual constipation* it does good by increasing the tonus of the intestinal walls, increasing peristalsis. In *atonic* and *epidemic diarrhœas* the tincture is very valuable; in *pneumonia* and *typhoid* when there is dyspnœa and cardiac failure; in the *cardiac irregularity of hysteria* and in *hypochondriasis;* in *amaurosis* from lead, alcohol, or tobacco,

strychnine is useful. In *anæmia* and *chlorosis*, combined with iron; in *diphtheritic paralysis; paraplegia* and *hemiplegia*, before degeneration has set in, are much benefited. In *bronchial* and *neurotic asthma;* in *nervous coughs* it is useful. Strychnine may be used as the antidote in acute poisoning from opium and chloral.

## OLEA VOLATILA (VOLATILE OILS).

**Group Characters.**—As a group they **constitute** the odorous, but not always the only active principle of plants. Physically they are **composed** of *eleoptens*, which are always liquid, as oil of camphor, and stearoptens, which are solids, as menthol, thymol, camphor, etc. The latter crystallize out, as a rule, in cool atmospheres while the eleoptens are always liquid.

Their **composition** is extremely complex; their commonest constituents being terpenes ($C_{10}H_{16}$), while many contain in addition ketones, phenols, aldehydes, acids and their compounds. Some contain C and H only, as oil of turpentine; others contain C, H, and O, as do most of them; others contain in addition S, as oil of mustard, while another contains N in the form of a cyanide, as the oil of bitter almonds.

Most of them **exist** preformed in the plant, while some are formed by the reaction of certain constituents of certain substances when brought into contact with water, as the oil of mustard and the oil of bitter almonds. They are, when pure, colorless, but the presence of organic matter in time produces colors, which to certain oils are characteristic. According to Piesse, the blue color of oil of chamomile is due to *azulene*, a nitrogenous body. The yellow color of most oils is due to the presence of oxidized resins, while the green color of the oil of absinth and the brown of cinnamon are due to various mixtures of azulene and resin. As a class they are **insoluble** in water, but impart a decided

odor and taste to it. They are **soluble** in strong alcohol, ether, chloroform, benzine, and fixed oils. A **group dose**, with an exception or two, which are noted, is 1 to 5 ♏ (0.06 to 0.30 c.c.).

**Action.**—In general, the action of the eleoptens, stearoptens, natural oleoresins and resins, and the balsams is the same, differing *only in degree.*

*Externally.*—Owing to their volatility when applied to the skin, they penetrate readily, causing irritation (sensory stimulation), redness, and warmth, due to dilatation of cutaneous arterioles, which may be due to protoplasmic action or, reflexly, from irritation. Their action on mucous membrane is somewhat more severe. In most the primary irritation is followed by anæsthesia of a greater or lesser degree.

*Internally.*—In the *mouth* the same local action ensues: there is a hot, burning taste (some are cooling at first) and an increased flow of saliva. In the *stomach* there is the same sensation of warmth, motility is increased, but this cannot be said of the secretion. In the intestine, while it is not definitely known whether peristalsis and secretion are increased, flatulence at any rate is relieved, as are also the griping and pain from the action of purgatives. Large doses excite gastroenteritis, which causes hyperæmia of adjacent viscera; hence the popular use of some of the oils, as savin, rue, etc., in amenorrhœa, and also as *ecbolics.*

*Excretion.*—They are eliminated by the pulmonary and genitourinary tracts, the mucous membrane of which is stimulated and secretion is increased; in their elimination they act as antiseptics. Large doses are irritant and may cause acute bronchitis and nephritis, while some, like turpentine, may cause hæmaturia or even suppression.

On the *cerebrum* there is little effect from medicinal doses; large doses cause excitement and confusion, delirium, violent movements followed by epileptiform convulsions, with or without unconsciousness. The *medulla* is stimulated; the

*respiration* is quickened and deepened; large doses paralyze the medulla.

*Circulation.*—The heart is slowed but its force is stronger; the first due to central vagal effect, the latter to stimulation of the heart muscle. *Blood pressure* is raised at times, then lowered, possibly due to intermittent stimulation of the vasomotor centre. The *skin* is flushed after large doses and is explained as due to some action on the vasodilator centre. The **uses** of the volatile oils are described under their respective headings.

## OLEUM AMYGDALÆ AMARÆ (OIL OF BITTER ALMOND).

A volatile oil **obtained from** bitter almond (*Prunus amygdalus*, variety *amara*), and other seeds containing amygdalin, by maceration with water and subsequent distillation. It should contain not less than 85 per cent. of benzaldehyde and not less than 2 nor more than 4 per cent. of hydrocyanic acid.

**Characters.**—It is a yellowish or colorless oil, with the odor of the kernels. The **odor** of the oil has been ascribed as due to HCN. But this is not so, for the pure oil has an odor distinctive to itself. It is **soluble** in 300 parts of water and freely in alcohol and ether.

It is **composed** chiefly of *benzaldehyde*, with a small portion of HCN, glucose, etc., all formed by the reaction between *amygdalin* (a glucoside) and *emulsin* (a ferment) in the presence of water. In time the benzaldehyde oxidizes into benzoic acid, which deposits in the container as whitish crystals. **Dose,** $\frac{1}{6}$ to $\frac{1}{2}$ ♏ (0.01 to 0.03 c.c.).

**Benzaldehydum (Benzaldehyde or Artificial Oil of Bitter Almond).**—Is official and now largely used and is preferred on account of its uniformity of composition. It is, however, liable to contain chlorine compounds due to its manufacture from toluol by aid of chlorine. **Dose,** $\frac{1}{6}$ to $\frac{1}{2}$ ♏ (0.01 to 0.03 c.c.).

It is exceedingly poisonous and the symptoms partake largely of those of hydrocyanic acid. Its uses are those of hydrocyanic acid.

### OLEUM GOSSYPII SEMINIS (COTTON-SEED OIL).

A fixed oil **expressed** from the seed of *Gossypium herbaceum*, and other species of gossypium, and subsequently purified. It **contains** *olein, palmitin,* and *stearin,* which are the *glycerides* of these acids respectively. It is **used** as a substitute for olive oil and for most purposes is equal to it. It enters into **Linimentum Camphoræ** or **Camphorated Oil** and **Linimentum Ammoniæ** or **Ammonia Liniment.**

### OLEUM MORRHUÆ (COD LIVER OIL).

A fixed oil **obtained** from the fresh livers of *Gadus morrhua* and other species of Gadus. Its **composition** varies, as there are several grades of oil from light brown and nearly odorless to very dark brown and ill-smelling, all depending on the freshness of the livers; aside from the olein and palmitin present there are traces of iodine, bromine, chlorine, phosphorus, and sulphur. Depending on their freshness, there are present various ptomaines, as *aselline* and *morrhuine* (Gautier and Mourgues), as well as the volatile bases, as *butylamine, amylamine, dihydrotoluidine,* and *hexylamine.* The darker and more ill-smelling the oil the more cadaveric alkaloids are present.

**Uses.**—It may be used as a *nutrient* in wasting diseases, as *phthisis, scrofula, rickets;* in *chlorosis, chronic bronchitis,* and *emphysema;* it is used in *chronic rheumatism, rheumatoid arthritis,* and *arteriosclerosis;* locally it is used in *scaly skin diseases* to allay *irritation,* and by *inunction* for any possible effect in wasting diseases where the oil is not well borne internally.

## OLEUM OLIVÆ (OLIVE OIL).

A fixed oil **expressed** from the ripe fruit of *Olea europœa*, a shrubby tree indigenous to Western Asia but cultivated widely. It **contains** olein, palmitin, and stearin.

**Uses.**—As a bland, agreeable oil it is very useful as an *emollient* and *demulcent*. It is much used as a dressing for *burns*, *wounds*, *bites* and *stings* of insects; also to soften *scales* and *crusts* in skin diseases.

## OLEUM RICINI (CASTOR OIL).

A fixed oil **expressed** from the seed of *Ricinus communis*, a plant indigenous to Western Asia, but cultivated widely. It **contains** palmitin, stearin, and ricinolein, the latter being a combination of glycerin and ricinoleic acid; the latter substance being set free in the intestine by the bile and pancreatic juice unites with sodium, the resulting product acting as a cathartic on account of its irritating properties. Castor seed contains a globulin, *ricin*, which is intensely poisonous injected into the blood; by the stomach it is altered and is harmless; it is not present in the oil.

**Uses.**—Its chief use is that of a *purgative*. It may be given in capsule or mixed with glycerin and disguised with a volatile oil. **Dose,** f℥¼ to 2 (8 to 60 c.c.).

## OLEUM TIGLII (CROTON OIL).

A fixed oil **expressed from** the seed of *Croton tiglium*, indigenous to East Indies. The oil is **composed** of palmitin, stearin, and crotonolein; the latter undergoes the same changes as does ricinolein in the intestine; it is, however, much more irritating, causing in large doses violent gastroenteritis.

Owing to the fact that some of the crotonoleic acid exists free in the oil accounts for its irritating properties when applied to surfaces, either mucous, or skin.

**Action and Uses.** *Externally.*—Applied to the skin or taken into the mouth undiluted it causes irritation, vesication and, if left in contact, pustulation. It is used as a counter-irritant.

*Internally,* it should be administered in ½ to 2 ♏ (0.03 to 12 c.c.) **doses** on sugar, in a bread pill, or in a bland oil. Taken into the stomach it causes a sense of heat, griping, abdominal pain, followed in from one to three hours by profuse, watery stools, with some pain about the anus. It is used in cases of *intestinal obstruction* due to accumulated feces from intestinal torpor; as a *revulsant* in cerebral affections, as *apoplexy,* and in *lead poisoning.*

## OLEUM THEOBROMATIS (CACAO BUTTER).

A fixed oil **expressed from** the seed of *Theobroma cacao.* Habitat, South America. Is a yellowish-white solid, with an agreeable odor and a chocolate taste. It **melts** at 30° to 33° C. (86° to 91.4° F.).

The **use** of cacao butter is as a basis for suppositories and ointments.

## OLEUM THYMI (OIL OF THYME. OIL OF ORIGANUM).

A volatile oil distilled from the leaves and flowering tops of *Thymus vulgaris* (garden thyme), yielding on assay not less than 20 per cent. of phenols.

The **chief constituent** of the oil is—

## THYMOL.

Thymol is a phenol which occurs also in the oils of *Monarda punctata* and *Carum ajowan.* **Exists** in the form of large, colorless crystals, of a thyme-like odor and an aromatic, pungent, and somewhat caustic taste. Is **soluble** in 1200 parts of water, freely in alcohol, ether, chloroform, and oils. **Dose,** 1 to 5 grs. (0.06 to 0.30 gm.).

Its action is that of volatile oils.

**Uses.**—Thymol is a *mild antiseptic;* it is used as an *antifermentative* and *disinfectant;* by some it is used as a *local anæsthetic* but there are better. Externally it is used in solution in oils as a spray in *otologic, rhinologic,* and *laryngologic* practice; also in *stomatitis, diphtheria;* as an intestinal antiseptic in *dysentery, typhoid,* and *diarrhœa;* also used as an expectorant in *phthisis* and *bronchitis.*

Full doses of thymol must not be given with alcohol because its absorption is then so rapid as to lead to poisoning.

## OPIUM.

**Source.**—The concrete, milky exudation obtained by incising the unripe capsule of *Papaver somniferum* (white poppy), and yielding in its normal moist condition not less than 9 per cent. of crystallized morphine, when assayed by the official process. **Dose,** $\frac{1}{2}$ to 2 grs. (0.03 to 0.12 gm.).

Opium is indigenous in Western Asia but is cultivated elsewhere. The **alkaloids of opium** of importance are: *morphine,* 9 per cent.; *codeine,* 0.2 to 0.7 per cent.; *papaverine,* 1 per cent.; *thebaine,* 0.15 to 1 per cent.; *narceine,* 0.02 to 0.7 per cent.; *narcotine,* 1.3 to 10 per cent.; the acids present are *meconic, lactic,* and *sulphuric,* all in combination with the alkaloids.

### The Preparations of Opium.

**Opii Pulvis** (**Powdered Opium**).—Contains not less than 12 per cent. nor more than 12.5 per cent. of morphine. **Dose,** $\frac{1}{4}$ to 2 grs. (0.015 to 0.12 gm.).

**Opium Deodoratum** (**Deodorized Opium**).—Narcotine removed with ether. Otherwise is the same as powdered opium. **Dose,** the same.

**Opium Granulatum** (**Granulated Opium**).—Dried and coarsely powdered opium.

**Pilulæ Opii** (**Pills of Opium**).—Each contains 1 gr. (0.06 gm.).

**Pulvis Ipecacuanhæ et Opii** (**Powder of Ipecac and Opium**).—Contains 10 per cent. of each. Sugar of milk q. s. to 100. **Dose,** 5 to 20 grs. (0.30 to 1.20 gm.).

**Trochisci Glycyrrhizæ et Opii** (**Troches of Glycyrrhiza and Opium**).—Each contains $\frac{1}{12}$ gr. (0.005 gm.) of opium.

**Extractum Opii** (**Extract of Opium**).—An aqueous extract, containing 18 per cent. of morphine and freed from those disturbing principles insoluble in water. **Dose,** $\frac{1}{8}$ to 1 gr. (0.0075 to 0.06 gm.).

**Acetum Opii** (**Vinegar of Opium. Black Drop**).—Ten per cent. strength. **Dose,** 5 to 20 ♏ (0.30 to 1.20 c.c.).

**Tinctura Opii** (**Tincture of Opium. Laudanum**).—Ten per cent. strength. **Dose,** 5 to 20 ♏ (0.30 to 1.20 c.c.).

**Tinctura Opii Deodorati** (**Deodorized Tincture of Opium**).—Strength, 10 per cent. **Dose,** 5 to 20 ♏ (0.30 to 1.20 c.c.).

**Tinctura Ipecacuanhæ et Opii** (**Tincture of Ipecac and Opium**).—Strength, 10 per cent. **Dose,** 5 to 20 ♏ (0.30 to 1.20 c.c.).

**Vinum Opii** (**Wine of Opium**).—Strength, 10 per cent. **Dose,** 5 to 20 ♏ (0.30 to 1.20 c.c.).

**Tinctura Opii Camphorata** (**Camphorated Tincture of Opium. Paregoric**).—Contains 0.4 per cent. of opium. **Dose,** $\frac{1}{8}$ to 1 ℥ (4 to 30 c.c.).

**Emplastrum Opii** (**Plaster of Opium**).—Contains 6 per cent. of extract of opium.

**Morphina.**—Seldom used. **Dose,** $\frac{1}{8}$ to $\frac{1}{4}$ gr. (0.008 to 0.015 gm.).

**Morphinæ Acetas.**—Soluble in 2.25 parts of water, when fresh. **Dose,** $\frac{1}{8}$ to $\frac{1}{4}$ gr. (0.008 to 0.015 gm.).

**Morphinæ Hydrochloridum.**—Soluble in 17.2 parts of water. **Dose,** $\frac{1}{8}$ to $\frac{1}{4}$ gr. (0.008 to 0.015 gm.).

**Morphinæ Sulphas.**—Soluble in 15.3 parts of water. **Dose,** $\frac{1}{8}$ to $\frac{1}{4}$ gr. (0.008 to 0.015 gm.).

**Pulvis Morphinæ Compositus** (**Tully's Powder**).—Contains 1.5 per cent. of morphine, with camphor, licorice, and calcium carbonate. **Dose,** 5 to 15 grs. (0.30 to 1 gm.).

**Apomorphinæ Hydrochloridum** (**Apomorphine Hydrochloride**).—An artificial alkaloid obtained from morphine by the action of strong acids or zinc chloride in sealed tubes. The morphine loses a molecule of water. Is in the form of minute, grayish-white crystals, odorless, taste faintly bitter. Is **soluble** in 39.5 parts of water. On exposure to air it acquires a greenish tint. **Dose,** $\frac{1}{20}$ to $\frac{1}{10}$ gr. (0.003 to 0.006 gm.) by mouth; $\frac{1}{20}$ to $\frac{1}{6}$ gr. (0.003 to 0.01 gm.) *hypodermically.*

**Codeina** (**Codeine**).—Exists in opium, like morphine, in combination with meconic acid. Is in the form of large rhombic, more or less translucent crystals; odorless and slightly bitter; is **soluble** in 88 parts of water. **Dose,** $\frac{1}{2}$ to 2 grs. (0.03 to 0.12 gm.).

Two salts are official, the phosphate and sulphate. **Dose,** the same.

**Heroin.**—The diacetic acid ester of morphine derived by substituting two acetic esters for two atoms of O and H in morphine. Exists in the form of a white, crystalline, odorless powder, with a faintly bitter taste. Is almost **insoluble** in water, freely in acetic acid without decomposition. The **hydrochloride** is used most, and is **soluble** in water. **Dose,** $\frac{1}{6}$ to $\frac{1}{2}$ gr. (0.01 to 0.03 gm.).

**Symptoms.**—In *small amounts* little is observed until there is a disinclination for voluntary movement, and unless kept awake sleep follows with perhaps pleasant dreams; the patient is easily awakened but soon drops off to sleep again. Usually on awakening there is nausea and at times vomiting, headache, and depression. *Larger doses* cause a deeper sleep which passes into a torpor from which the patient is aroused with difficulty; the respirations are slow; the pulse full and regular; the pupils are contracted to pin-points through centric stimulation of the motor oculi; the skin is dry and warm, the face is suffused and later cyanotic. The respirations become slower and shallower; the pulse small and rapid; torpor passes into coma; the pupils dilate widely; and death, the result of respiratory paralysis, the heart ceasing soon afterward.

**Action.** *Nervous System.*—The higher (psychical) centres are depressed and the excitability of the motor areas after large doses is lowered and finally paralyzed; in the medulla the respiratory centre is depressed and later paralysis follows. There is little effect on the cord in man. There is no effect on peripheral nerve endings either sensory or motor.

*Circulation.*—There is little direct effect in small amounts. Large doses cause a primary acceleration followed by slowing, the latter due to vagal inhibition. Blood pressure is not raised by moderate doses; toxic doses cause a rise and fall varying with the degree of asphyxia. The redness and cyanosis seen are due to dilatation of cutaneous arterioles, the cause for which is in doubt; it accounts for the warmth of the skin and the perspiration seen at times.

*Alimentary Tract.*—Through central action on the nervous system the salivary, gastric, and pancreatic secretions are lessened, the motility of the stomach and bowel are impaired; and nausea and vomiting are usual effects. Constipation, the usual result of opium, is probably due to stimulation of the inhibitory nerve apparatus which checks peristalsis.

*Absorption.*—Opium is rapidly absorbed and eliminated

mainly by the alimentary tract; it is found in the saliva and gastric and intestinal juices. After large doses it appears in the urine and milk; also in the sweat which opium increases, while all other secretions are checked.

**Codeine** acts in a manner similar to morphine, which it may be said represents opium; codeine is less hypnotic, does not depress the respiration so markedly, and is less constipating than morphine.

**Papaverine** is a direct cardiac sedative and a mild hypnotic.

**Thebaine** has an action resembling strychnine.

**Narcotine** resembles but is less poisonous than codeine.

**Narceine** is feebly hypnotic.

**Apomorphine** is an emetic acting through the medulla independently of any local action on the stomach; its effects are produced whether taken by the stomach or hypodermically. It is said to act by stimulating the vomiting centre. Its effects on the circulation, respiration, and nervous systems are not marked save that toxic doses cause delirium. It has an expectorant action in doses less than those which produce emesis.

**Heroin** resembles codeine but is more depressing to the respiratory centre; it is used to quiet cough but it is apt to cause vomiting.

**Treatment of Acute Opium Poisoning.**—No matter how the drug may have been taken, emetics and stomach lavage are indicated for it is thrown off to a certain extent in the stomach; the patient must be kept awake and respiration must be maintained; active stimulants are of value. *Chemical antidotes* are tannic acid and potassium permanganate; the *physiological antidotes* are atropine (administered with care), strong black coffee (caffeine). Body temperature must be maintained.

**Uses.**—*Externally* opium may be used to relieve *pain*, but there are better agents.

*Internally* it may be used for pain from any cause, the dose required for relief will vary according to the intensity of the

pain as in *peritonitis*, *meningitis*, *pericarditis*, and *pleuritis*. As a *hypnotic* when insomnia is due to pain. As an *antispasmodic* in *asthma*, the convulsions of *tetanus*, *hydrophobia*, etc. Alone or in combination in *dysentery*, *serous diarrhœa*, *cholera morbus*, to check peristalsis and secretion. In *bronchitis* with profuse expectoration; in *irritable cough*, morphine, codeine, or heroin may be used. In *colic* due to lead poisoning. To *check secretion* in *diabetes insipidus* and *mellitus*, morphine or codeine may be used, preferably the latter. Apomorphine may be used whenever an emetic is indicated; it is particularly good when the stomach will not respond to irritative emetics, as in *opium poisoning* or other conditions when prompt emesis is desired.

## PANCREATINUM (PANCREATIN).

**Source.**—A mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog (Sus scrofa). It **contains** four ferments: *trypsin*, which digests proteids; *steapsin*, which emulsifies fats; *amylopsin*, which converts starch into sugar; *rennin*, which coagulates milk. If 0.28 gm. of pancreatin and 1.5 gm. of sodium bicarbonate be added to 100 c.c. of tepid water and 400 c.c. of fresh cows' milk heated to 38° C. (100.4° F.) be added and the temperature maintained the milk should be peptonized in thirty minutes; shown by fact that no precipitate occurs on addition of nitric acid.

Also when assayed by the U. S. Pharmacopœia process it should convert not less than twenty-five times its own weight of starch into substances soluble in water. Pancreatin acts best in an alkaline medium. There is some doubt that when administered it passes through the stomach unchanged.

**Form.**—It is a cream-colored powder with a faint, peculiar odor and a meat-like taste; is completely soluble in water,

insoluble in alcohol; acids render it inert. **Dose**, 10 to 20 grs. (0.60 to 1.20 gm.).

**Uses.**—It is used in *intestinal indigestion* and should be given from two to four hours after meals. It may be administered in pills coated with keratin or other substances not affected by the gastric juice in order that it may pass through the stomach unchanged and exert its influence in the intestine.

## PAPAIN (PAPOID. PAPAYOTIN).

**Source.**—The inspissated juice or digestive principle of fruit of *Carica papaya*, a South American tree. It is a white, hygroscopic, amorphous powder. **Dose**, 2 to 10 grs. (0.12 to 0.60 gm.). It is not official.

It is **used** as a digestant and acts in acid, alkaline, or neutral media; its action is similar to pancreatin in its digesting power. It is used as a digestant for false membranes; also as an anthelmintic—as such it is said to act by digesting the ascarides and tæniæ. It may be used in indigestion, given after meals in powder, capsule, or in aqueous solution.

## PEPSINUM (PEPSIN).

A proteolytic ferment **obtained from** the glandular layer of the fresh stomach from healthy pigs, and capable of digesting not less than 3000 times its own weight of freshly coagulated and disintegrated egg albumen when tested by the official process. **Dose**, 5 to 60 grs. (0.30 to 4 gm.).

Is in the **form of** fine white or yellowish-white amorphous powder or scales, which are pale yellow and transparent; should be odorless; its taste slightly acid or slightly saline followed by a suggestion of bitterness. It attracts moisture slowly and is **soluble** in about 100 parts of water with opalescence, but more soluble in acidulated water.

**Uses.**—As a constituent of the gastric juice it is indicated where there is lessened secretion, in *atonic dyspepsia, gastralgia, gastric ulcer,* and *cancer,* and in the *dyspeptic diarrhœa* of infants. It is best given near or during meal-time.

## PHENOL (CARBOLIC ACID. PHENOL).

**Source.**—Hydroxylbenzene, a constituent of *coal-tar,* obtained by fractional distillation and subsequently purified. Synthetically from benzene or from pure anilin oil by the aid of $H_2SO_4$.

**Characters.**—Colorless, needle-shaped crystals, of a characteristic odor, a burning taste followed by numbness; deliquescent in damp air and acquires, from some unknown cause, a reddish tinge in time, *which does not impair its value.* It has a slightly acid reaction, but does not neutralize alkalies; combines with bases forming weak combinations, and coagulates albumen.

**Solubility.**—In about 19.6 parts of *water,* at 25° C.; freely in *alcohol, ether, chloroform, glycerin, oils,* both fixed and vølatile. It liquefies on heating or by the addition of about 8 per cent. of water. **Dose,** ½ to 2 grs. (0.03 to 0.12 cgm.), well diluted with water.

### The Official Preparations of Phenol.

**Unguentum Phenolis (Ointment of Phenol).**—3 per cent. in strength.

**Glyceritum Phenolis (Glycerite of Phenol).**—Contains 20 per cent. of liquefied phenol. **Dose,** 1 to 10 grs. (0.06 to 0.60 cgm.) in water.

**Phenol Liquefactum.**—A liquid composed of not less than 86.4 per cent. of absolute phenol and about 13.6 per cent. of water. **Dose,** ½ to 2 grs. (0.03 to 0.12 cgm.) diluted.

**Action.** *Externally.*—Applied *concentrated* and *momentarily* it causes a burning pain, followed by a numbness as

a whitish discoloration occurs, which changes to reddish as desquamation takes place; if the application is *prolonged* a white eschar forms, becoming brownish. Gangrene may follow. Phenol produces no vesication.

It is readily absorbed and care must be exercised in using it even in weak solutions on sound skin or broken surfaces, for toxic effects may result. Gangrene has followed in such cases.

*Internally.*—Its effects on mucous membranes are the same as when externally applied. The severity of the lesions depends upon the concentration of the acid. If not diluted it acts as a violent gastrointestinal irritant (see toxicology).

In medicinal doses it has no effect on the enzymes of the mouth or stomach, or upon secretion.

The *circulatory, nervous,* and *respiratory systems,* as well as the *temperature,* are not affected by *medicinal doses.* In *full doses* it slows the heart and lowers arterial tension, due to a depression both of the heart itself and of the vasomotor centre. In the *nervous system,* in *full doses,* the early vertigo, stupor, and convulsions, when seen, point apparently to either spinal or cerebral depression.

*Respirations* are early accelerated, due to central and peripheral vagal stimulation, which also involves the respiratory centre.

*Temperature.*—In *full doses* it diminishes the production of heat and increases its radiation.

*Absorption and Excretion.*—It is rapidly absorbed from the stomach and intestines, and probably circulates in the blood as the alkaline carbonate, or unchanged. It is partly oxidized in the blood and appears in the urine as salts of glycuronic and sulphocarbolic acid.

The *urine* assumes a dark color, even after moderate doses, due to oxidation of the foregoing products to hydroquinone and pyrocatechin, or oxidation products of these.

**Toxicology.**—*The symptoms depend on the size and concentration of the dose.* If at all *concentrated,* immediately

after swallowing there is an intense burning in the mouth, œsophagus, and stomach. White eschars form on the lips, face, tongue, and pharynx, etc., where the acid has touched. There are symptoms of *gastroenteritis*, pain, nausea, vomiting, and purging; the patient *collapses*, the *skin* is cold and clammy; the *face* is pinched and the expression is anxious; the *pulse* is weak and thready; *reflexes* are abolished; *breathing* becomes more and more feeble and shallow and finally ceases. Large concentrated doses may kill immediately.

**Treatment of Poisoning.** I. *Antidote of the Unabsorbed drug.*—Whiskey or diluted alcohol immediately and repeatedly—pure alcohol is advocated by some; soluble sulphates (especially of magnesium and sodium); saccharinated lime.

II. *Antidote of the Absorbed Drug.*—External heat; atropine or strychnine hypodermically, in doses according to the amount of shock; opium for the relief of pain; demulcent drinks in the later stages for the gastroenteritis.

**Therapeutic Uses.** *Internally.*—It is at the present time only occasionally used in *irritability* of the *gastrointestinal* mucous membrane, and when there is a tendency toward *fermentation.* It may be employed in *gastrodynia, nervous vomiting*, in 1 to 3 drop doses every three hours.

*Externally.—Concentrated* it is an *active caustic;* care must be exercised to avoid applying it to too large surfaces, because of the danger of absorption. It is very useful in the removal of *dermal growths. Well diluted* with oil it is very useful in the pain of *superficial burns.* In 5 per cent. solutions it relieves almost all forms of *pruritus*, as in *chronic eczema*, and *parasitic skin diseases*, as *Tinea capitis*, *T. tonsurans*, *T. circinata*, and *favus.* The glycerite is used in *diphtheria, ulcerated sore throat, aphthous stomatitis.* It is employed as a *disinfectant* for *instruments*, etc., in solutions of from 3 to 5 per cent., or as a wash for wounds. In gargles, lotions, and in cavities 1 per cent. solutions are used. As an antiseptic agent, dissolved in fats, petrolatum, or oils, it acts scarcely at all, but these preparations are useful as dressings

for wounds, etc. Hueter employs it in *deep inflammations*, using a 2 per cent. solution, with deep injections; in *glandular swellings*, as *buboes;* in *inflamed bursæ*, *hydrocele*, and *erysipelas*. *Cellulitis* yields to solutions of 0.5 to 1 per cent. strength.

**Sodii Phenolsulphonas** (**Sodium Phenolsulphonate. Sodium Sulphocarbolate**). **Form.**—Colorless, transparent crystals, odorless and of cooling, saline, slightly bitter taste, **soluble** in *water*, less so in *alcohol*. **Dose**, 10 to 30 grs. (0.60 to 2 gm.).

**Action.**—*In the system* the salt is converted into carbolic acid and sodium sulphate.

**Uses.**—It is *topically* applied in *relaxed conditions* of the throat, in *diphtheria*, *tonsillitis*, *nasal catarrh*, and in *aphthæ*. *Internally*, in *fermentative dyspepsia*, *diarrhœa* due to fermentation and in *flatulency*.

## PHOSPHORUS.

Phosphorus is **prepared from** the calcium phosphate of bones. It should contain not less than 99.5 per cent. of pure phosphorus.

### The Official Preparation of Phosphorus.

**Pilulæ Phosphori** (**Pills of Phosphorus**).—Each contains 0.0006 gm. ($\frac{1}{100}$ gr.). **Dose**, 1 to 2 pills.

**Action.**—*Locally* applied phosphorus produces inflammation, ulceration, and occasionally gangrene. In those exposed to and inhaling its vapors, necrosis of the upper and lower jaw bones is seen; caries of the teeth seems to be a predisposing factor; the result may be due to the phosphorus itself or to its oxidation products.

*Internally.*—Small doses increase the functional activity of the stomach and promote nutrition; long-continued use impairs digestion; the functions of the nervous system,

mental and sexual activity are increased; the formation of compact tissue is increased in the spongy portion of short and long bones—at least in young animals.

Phosphorus is eliminated by the kidneys, mucous membranes, liver, and skin.

**Poisoning.**—Symptoms do not develop until some hours afterward, when violent epigastric pains appear, then nausea and vomiting of material of an alliaceous odor and which is luminous in the dark; later the vomited material is dark and grumous, due to altered blood; there are purging and intense abdominal pain. The symptoms may subside and after several days jaundice appears, with restlessness, headache, dizziness, and noisy delirium; the pulse at first full and strong becomes feeble and rapid; coma and convulsions precede death. The urine is diminished, contains albumin and biliary pigments. After death the liver is found to be enlarged and pale, its cells having undergone fatty degeneration; the secretory epithelium of the kidneys and the mucous lining of the gastrointestinal tract are similarly affected, as also are heart and smaller bloodvessels.

**Treatment of Poisoning.**—Prompt emesis is indicated if seen early; *copper sulphate* is preferred on account of its forming with the phosphorus the insoluble *phosphide. Hydrated magnesia* is given as a purgative; the stomach may be washed out with a 3 per cent. solution of *potassium permanganate* or with *hydrogen dioxide.* Old *oil of turpentine* may be given in small doses for several days. *Opium* is indicated for depression and pain. *Oils* and *fats* of all kinds should be *avoided,* as they render the phosphorus soluble. **Acute phosphorus poisoning** so much in every particular resembles *acute yellow atrophy* of the *liver* that they are indistinguishable.

**Uses.**—Phosphorus may be used in *nervous exhaustion, functional impotence, neurasthenia;* in *neuralgia* of the fifth nerve. It is recommended in *osteomalacia* and *rachitis,* also in *anæmia.*

## PHYSOSTIGMA (CALABAR BEAN).

**Source.**—The ripe seed of *Physostigma venonosum*, a woody creeper of Western Africa, containing when assayed (U. S. P.) not less than 0.15 per cent. of alkaloids soluble in ether. It **contains** *physostigmine, calabarine* and possibly *eseridine* which resembles physostigmine.

### The Preparations of Physostigma.

**Extractum Physostigmatis (Extract of Physostigma).**—**Dose,** $\frac{1}{10}$ to $\frac{1}{2}$ gr. (0.006 to 0.03 gm.).

**Tinctura Physostigmatis (Tincture of Physostigma).**—10 per cent. **Dose,** 10 to 30 ♏ (0.60 to 2 c.c.).

**Physostigminæ Sulphas (Physostigmine Sulphate).**—A white or yellowish-white microcrystalline powder, odorless and bitter. Is very deliquescent; acquires a reddish tint.

**Physostigminæ Salicylas.**—Resembles the above except that it is not deliquescent. **Dose,** of both, $\frac{1}{100}$ to $\frac{1}{30}$ gr. (0.0006 to 0.002 gm.).

**Symptoms.**—After large doses physostigma causes nausea, muscular weakness with tremors later, giddiness and a slow, irregular pulse; sometimes there is vomiting and purging; the pupils are contracted, reflexes are abolished and motor paralysis ensues; the respirations at first rapid become slow, weak, and dyspnœic, with death the result of paralysis of the respiratory centre.

**Action.**—*Externally* physostigma has no action, save when applied to the eye it produces myosis.

*Internally.*—On the nervous system there is little effect on the cerebrum; it is a direct paralysant to the cord and medulla.

*Respiration.*—Moderate doses have no effect; toxic doses accelerate the respiration, which later becomes slow and dyspnœic. The acceleration may be due either to stimulation

of the respiratory centre or stimulation of the peripheral vagal endings in the lungs. Dyspnœa is due to constriction of the bronchial tubes, which may be so severe as to result in asphyxia.

*Circulation.*—Small doses slow the heart action and raise blood pressure; the former due either to direct cardiac effect or to stimulation of the vagi, with evidence in favor of the former; blood pressure is raised, the result of direct effect on the vessel walls rendering their calibre smaller, or to centric vasomotor stimulation. Large doses render the heart slow and feeble, with cessation finally in diastole.

On the *alimentary tract* all the secretions, salivary, gastric, pancreatic, and mucous, are all increased, due to direct effect on the glands; peristalsis of the stomach and intestines is increased as also are the muscular contractions of the ureters, bladder, uterus, and bronchial tubes. In the *eye* the pupils are contracted by stimulation of the peripheral ends of the motor oculi nerves; intraocular pressure is lessened. The eye effects are induced by the local or internal application of the drug, and its results may be removed by atropine, and *vice versa*. Physostigma is *eliminated* by the urine.

**Treatment of Poisoning.**—Emetics and cathartics are indicated; the bladder should be catheterized to prevent resorption; diffusible stimulants, like ammonia, alcohol; strychnine or atropine, as the physiological antidotes, may be given hypodermically.

**Uses.**—In the eye it is used to *relieve intraocular tension*, as in *glaucoma;* as a *myotic* to *prevent* or *break* the formation of *adhesions* in the *iris*, also to *antagonize* the effects of *atropine* after it has been used as a mydriatic. *Internally*, it is used in *constipation* due to *torpor* of the bowel; it should be tried in *chorea;* also in *tetanus*, and as the *physiological antidote* in *strychnine* and *atropine* poisoning.

In ophthalmological practice the salicylate is used in solutions of 2 per cent. or less in strength.

## PILOCARPUS (JABORANDI).

**Sources.**—The leaflets of *Pilocarpus jaborandi* and *Pilocarpus microphyllus*, plants of Brazil. The leaflets contain two alkaloids, pilocarpine and isopilocarpine, the latter present in but small amount. By many authorities it is held that they contain *pilocarpine* and *jaborine* together with *pilocarpidine* and *jaboridine;* while *pilocarpidine* and *pilocarpine* have a similar action, jaborine and jaboridine have an action resembling atropine, and, therefore, directly opposed to the two former.

The only **official preparation** is the **Fluidextractum Pilocarpi,** given in dose from 5 to 60 ♏. (0.30 to 4 c.c.).

**Pilocarpine** is a colorless, syrupy alkaloid, and of itself it is very little used. Two salts of the alkaloid are official, as the **Hydrochloride** and the **Nitrate.** **Dose,** $\frac{1}{60}$ to $\frac{1}{2}$ gr. (0.001 to 0.03 gm.).

**Action.**—The cardinal effect of pilocarpine is to produce a marked increase of almost all *secretions* of the body; the nasal and respiratory secretions, perspiration, saliva, the gastric and possibly the pancreatic and intestinal juices are increased; solids as well as the liquids. The bile, urine, and milk do not seem to be affected, although the urine is lessened proportionate to the amount of water thrown off by the other secretions.

The cause of this increase in secretion is a direct stimulation of the peripheral ends of the secretory nerves supplying the glands. The unstriped muscle fibres of the stomach and intestines are caused to contract by a stimulation of the peripheral nerve endings in them and an increase of peristalsis results. The same applies to spleen, bladder, and bronchi. Large amounts cause nausea, vomiting, and purging.

*Circulation.*—Pilocarpine causes a preliminary acceleration of the pulse with increased blood pressure; the former

due to vagus paralysis, the latter partly to vasomotor effect; later the heart weakens and slows while pressure falls, all due to a direct depressing effect on the heart muscle.

There is but little action on the *central nervous system;* the *respirations* are but slightly affected, but the bronchial secretion is increased. Pilocarpine is eliminated chiefly through the skin.

The *pupils* are contracted by stimulation of the endings of the oculomotor nerves. Intraocular tension is at first raised, then followed by a fall.

**Uses.**—The chief use of pilocarpus, either hypodermically or internally, is as a *diaphoretic* for the removal of fluid (as much as one gallon may be removed by one administration); it is used to remove *pleuritic effusions;* in *uræmia,* in *acute* and *chronic* Bright's disease. In *dropsies cardiac* in origin and in *pulmonary œdema* it is *contraindicated.* It may be used in *dryness* of the throat, as an *expectorant* in *bronchitis, asthma,* and in *bronchorrhœa.* Externally the alkaloid or the fluidextract may be used in *alopecia.* As a *myotic* the alkaloid is used. It is the *physiological antidote* in belladonna poisoning.

## PLUMBUM (LEAD) AND ITS OFFICIAL SALTS.

Lead itself is not used in medicine; its salts are.

**Plumbi Acetas (Sugar of Lead).**—Soluble in 2.3 parts of water, 20 of alcohol. **Dose,** ½ to 5 grs. (0.03 to 0.30 gm.).

**Liquor Plumbi Subacetatis (Solution of Lead Subacetate. Goulard's Extract).**—Contains 25 per cent. Is used externally.

**Liquor Plumbi Subacetatis Dilutus (Diluted Solution of Lead Subacetate. Lead Water).**—Contains 4 per cent. Is used externally.

**Ceratum Plumbi Subacetatis** (**Cerate of Lead Subacetate. Goulard's Cerate**).—Contains Goulard's extract 20, camphor 2 gm., with wool-fat, paraffine, and white petrolatum. Used externally.

**Plumbi Iodidum** (**Iodide of Lead**).—A heavy bright-yellow powder, odorless and tasteless. Soluble in 2000 parts of cold water; slightly in alcohol, forming a colorless solution. **Dose,** $\frac{1}{6}$ to 1 gr. (0.01 to 0.06 gm.). Used externally chiefly in the ointment, which is 10 per cent. in strength.

**Plumbi Nitras.**—White, transparent crystals, odorless, with a sweetish astringent taste. Soluble in 2 parts of water. **Dose,** $\frac{1}{6}$ to $\frac{1}{2}$ gr. (0.01 to 0.03 gm.).

**Plumbi Oxidum** (**Litharge**).—A heavy, yellowish, or reddish-yellow powder, odorless and tasteless. Almost insoluble in water and alcohol. It is used externally in—

**Emplastrum Plumbi** (**Lead Plaster. Diachylon Plaster**).—Made with lead acetate and soap, forming lead oleate.

**Unguentum Diachylon** (**Diachylon Ointment**).—Contains 50 per cent. lead plaster.

**Action.**—*Locally* to unbroken skin there is little effect; to denuded surfaces it acts as an astringent by forming the albuminate with the albumin of the tissues forming a protective coating over the part. Applied concentrated in the form of the acetate or nitrate there is apt to be corrosion due to the effect of the acid (acetic or nitric) set free in the tissues.

*Internally.*—Single doses cause practically no symptoms; its persistent application internally or externally produces untoward effects, and this is particularly so when even minute amounts are administered for an extended period of time. Lead is absorbed from every surface and cases of chronic poisoning are common from kitchen utensils, lead water pipes, hair dyes, and those who handle it in the arts. It matters not to which surface or in what form applied, it is absorbed as the albuminate; it is stored up largely by the liver and also deposited as the sulphide in the edges of the

gums, giving the characteristic blue line seen in chronic poisoning. It is eliminated slowly by all channels.

**Acute Poisoning.**—A single large dose of any of the lead compounds causes gastrointestinal irritation, salivation, dysphagia, vomiting, diarrhœa, weakness, and collapse.

**Chronic Poisoning.**—This manifests itself in various ways. The most common seen being lead colic (painter's colic, *colica pictonum*), in which the abdomen is hard and contracted; sharp pains about the umbilicus due to violent contractions of the intestinal muscles undoubtedly caused by stimulation of peripheral nerves in the intestinal walls, which also check peristalsis and cause the obstinate constipation seen. Other effects of the action on peripheral nerves are seen as neuralgias, lead arthralgia in which there are intense pains in joints. Neuritis is often followed by paralysis of groups of muscles (the wrist-drop being characteristic and in which the extensor muscles are involved); anæsthesia and atrophy often follow the paralysis. The brain is also affected, in which the action is confined to the sensory and motor functions which are irritated, causing contractures of various groups of muscles, as the abdominal, etc., followed later by general convulsions. Headache, delirium, and coma are common.

**Treatment of Poisoning.**—In acute poisoning, evacuate the stomach; magnesium or sodium sulphate or dilute sulphuric acid are the chemical antidotes. In chronic poisoning the chief indications are the removal of the cause; soluble sulphates may be given to act as cathartics and also as antidotes. Potassium iodide is used to aid in the elimination. In lead colic belladonna is useful.

**Uses.**—*Externally* it is used as a *sedative astringent* in *acute inflammations;* in *acute eczema, impetigo, lichen,* and *erythema;* the solution of the subacetate is here used generally diluted with 4 parts of water or glycerin. As an injection in *gonorrhœa, gleet,* and *leucorrhœa;* also in *orchitis* and *synovitis.* Internally the only salt used is the subacetate,

and it may be used in *serous diarrhœa*, also the diarrhœas of *typhoid* and *yellow fevers;* also in the *diarrhœa* of *phthisis*. In *bronchorrhœa* it checks the secretion. In *hemorrhage* from *gastric ulcer, typhoid* and *yellow fevers*. From its sedative action on the heart it is often combined with digitalis in *cardiac hypertrophy*.

## PODOPHYLLUM (MAY APPLE. MANDRAKE).

**Source.**—The dried rhizome of *Podophyllum peltatum*, a plant indigenous to North America. It **contains** a *resin* which is composed chiefly of two glucosides, *podophyllotoxin* and *picropodophyllin*.

### The Official Preparations of Podophyllum.

**Fluidextractum Podophylli** (**Fluidextract of Podophyllum**).—**Dose**, 6 to 20 ♏ (0.30 to 1.20 c.c.).

**Resina Podophylli** (**Resin of Podophyllum**).—**Dose**, $\frac{1}{6}$ to 1 gr. (0.01 to 0.06 gm.).

**Action.**—Podophyllum applied to the *skin* and *mucous membranes* is an irritant; applied to open surfaces it is absorbed and produces purgative effects. *Internally* it is an irritant to *stomach* and *intestines;* it increases peristalsis and intestinal secretions, its action is accompanied by much griping pain; and is best used in combination with an antispasmodic like belladonna; it acts in from ten to twelve hours and although the feces are deeply bile-stained it is not a direct cholagogue.

**Uses.**—Chiefly in *habitual constipation*.

## POTASSIUM (KALIUM. POTASSIUM) AND ITS SALTS.

Potassium is not used in medicine, but its salts are.

**Potassii Hydroxidum** (**Potassium Hydroxide. Potassa**).—Is in the **form** of white translucent pencils or fused masses,

having a faint odor of lye and an acrid, caustic taste. Exposed to the air it absorbs moisture and $CO_2$, and deliquesces. Should be kept in glass-stoppered bottles. It is used externally as a *caustic.*

**Liquor Potassii Hydroxidi** (**Solution of Potassium Hydroxide**).—A 5 per cent. aqueous solution of KHO, colorless and odorless, an acrid caustic taste and strongly alkaline.

**Dose.**—10 to 30 ♏ (0.60 to 2 c.c.).

It is used as an *antacid* and *diuretic;* in *skin diseases* to soften horny epithelium, also to soften *impacted cerumen;* it is used to render the urine alkaline in *gonorrhœa* and *irritability* of the *bladder.*

**Potassii Acetas** (**Potassium Acetate**).—A white powder or crystalline mass of a satiny lustre, odorless and having a warm, saline taste; very deliquescent. Is **soluble** in water and alcohol, and should be kept in well-stopped bottles.

**Dose.**—15 to 60 grs. (1 to 4 gm.).

**Potassii Carbonas.**—**Dose,** 10 to 15 grs. (0.60 to 1.0 gm.). Is little used.

**Potassii Bicarbonas** (**Potassium Bicarbonate**).—**Occurs** as colorless, odorless, transparent crystals having a saline and slightly alkaline taste. **Soluble** in water.

**Dose.**—10 to 60 grs. (0.60 to 4 gm.).

**Potassii Bitartras** (**Potassium Bitartrate. Cream of Tartar**).- **Occurs** as colorless or slightly opaque crystals, or a white, somewhat gritty powder; odorless and having a pleasant acidulous taste; is permanent. **Soluble** in 200 parts of water, slightly in alcohol.

**Dose.**—℥j to ʒj (4 to 30 gm.).

**Potassii Chloras** (**Potassium Chlorate**).—**Occurs** as colorless, lustrous crystals or plates, or white powder, odorless and having a cooling, saline taste; is permanent and **soluble** in 16.7 parts of water. It should be kept in glass-stoppered bottles and it should not be brought in contact with organic or oxidizable matter or subjected to violent

trituration or concussion for explosion is apt to occur. **Dose**, 2 to 20 grs. (0.12 to 1.30 gm.).

**Potassii Citras** (**Potassium Citrate**).—Transparent, odorless prismatic crystals, or white, granular powder having a saline, cooling taste; it is deliquescent on exposure to air. Is freely **souble** in water, slightly in alcohol. **Dose**, 15 to 60 grs. (1 to 4 gm.).

**Potassii Citras Effervescens** (**Effervescing Potassium Citrate**).—The foregoing rendered effervescent by addition of citric acid and potassium bicarbonate. **Dose**, ℥ss to j (2 to 4 gm.).

**Potassii et Sodii Tartras** (**Potassium and Sodium Tartrate. Rochelle Salt**).—Colorless, transparent crystals or white powder, odorless and having a cooling, saline taste. **Soluble** in water and almost insoluble in alcohol. **Dose**, ℥ss to ℥viii (2 to 30 gm.). It enters into—

**Pulvis Effervescens Compositus** (**Compound Effervescing Powder. Seidlitz Powder**).—Contains Rochelle salt 8 gm. (℥ij) and sodium bicarbonate 3 gm. (40 grs.) in a blue paper and 2.26 gm. (35 grs.) tartaric acid in a white paper. **Dose.**—One or two dissolved separately, the solutions poured together and drunk while effervescing.

**Potassii Hypophosphis** (**Potassium Hypophosphite**).—White opaque plates or crystalline masses or granular powder, odorless, and having a pungent, saline taste; very deliquescent. Is **soluble** in water and alcohol. **Dose**, 5 to 30 grs. (0.30 to 2 gm.). It is used in *anæmia, chlorosis, scrofula*, etc.

**Potassii Nitras** (**Potassium Nitrate**).—Colorless rhombic prisms or crystalline powder, odorless and having a cooling, saline, and pungent taste. **Soluble** in water and sparingly in alcohol. **Dose**, 5 to 30 grs. (0.30 to 2 gm.).

**Potassii Permanganas** (**Potassium Permanganate**).—Slender prisms of a dark-purple color, odorless and having a sweet, afterward disagreeable, astringent taste. It should be kept in glass-stoppered bottles away from light and not

be brought into contact with oxidizable or organic substances. **Dose,** $\frac{1}{2}$ to 2 grs. (0.03 to 0.12 gm.).

**Potassii Sulphas.**—Colorless, transparent prisms or white powder having a bitter, saline taste and odorless. **Soluble** in water, insoluble in alcohol. **Dose,** ℥ss to ℥iv (2 to 16 gm.).

**Action.**—On the *alimentary tract* potassium salts in small amounts cause an irritation which reflexly increases the flow of gastric juice if given on an empty stomach; the bicarbonates in this condition enter the circulation unchanged, decompose the neutral and basic potassium phosphates, forming the acid potassium phosphate, which reduces the alkalinity of the blood and increases the acidity of the urine. On a full stomach the bicarbonates render the gastric juice less acid or even alkaline and interfere with the action of the pepsin; they are absorbed as the *carbonates* and render the blood more alkaline.

The acetate, bitartrate and citrate enter the circulation unchanged and are converted into the carbonates in the system and render the blood and urine more alkaline. All potassium salts are *diuretics*. They promote metabolism in small amounts; large amounts or long-continued administration cause emaciation due to lessened oxidation, which is shown by the lessened amount of urea eliminated. The same conditions depress the heart muscle, rendering it weak and slowing it; toxic doses stop the heart in diastole.

As a general protoplasmic poison, potassium affects the central *nervous system* in the same manner as it does the muscular and others; the functions are at first increased, later followed by depression and paralysis.

**Poisoning from the hydrate** or **carbonate** produce symptoms much alike, but which differ according to the degree of concentration. Either, concentrated, is corrosive, although the carbonate least so. Diluted they are irritants. They cause gastrointestinal irritation or corrosion; vomiting, diarrhœa, abdominal pain, symptoms of collapse, with marked depression of the heart. *Treatment.* Evacuation of the stomach;

dilution of the alkali with dilute acids, preferably organic; demulcent drinks to soothe; stimulants are indicated.

**Potassium Nitrate** differs in some respects from the other salts. It is more irritating, and while it is readily absorbed and part of it destroyed in the body the greater part passes out unchanged through the kidneys. While diuretic in small amounts, large amounts are distinctly irritating to the kidney, causing hæmaturia. Its effect as a diuretic is said to be due in part to direct action on the renal epithelium and partly to salt action. Poisoning from it is quite common; the symptoms are those of gastrointestinal irritation with hæmatemesis and bloody stools; the urine may be bloody or entirely suppressed; there are symptoms of collapse, muscular weakness, slow and shallow respiration, and a weak, thready pulse. Convulsions or paralysis may precede death. The treatment consists in evacuation of the stomach, administration of large quantities of water to aid dilution; stimulants and demulcents.

It is used as a *diuretic* and in *acute articular rheumatism*; also as a *gargle in tonsillitis* and *pharyngitis*, well-diluted. The **Charta Potassii Nitratis** is used in *spasmodic asthma*, being burned and the smoke inhaled.

**Potassium Chlorate** produces symptoms much like those of the other salts of potassium but seems to have a special action on the blood cells, in that in large doses it breaks up the red corpuscles and converts hæmoglobin into methæmoglobin; the cyanosis which it produces is due to this condition. It also causes nephritis with its phenomena (albumin, casts, hæmaturia, etc.); if severe, there may be symptoms of uræmia with coma and convulsions.

It is used as a *diuretic* in *dropsies* occasionally. Its chief application is in *stomatitis* and as a gargle in *tonsillitis* and *pharyngitis;* the troches may be used in the latter conditions.

**Uses of the Potassium Salts.**—*Externally.* The carbonate and bicarbonate are used in *pruritus;* the bicarbonate is

much used as a dressing for *burns* and the *swollen, painful* joints of *acute articular rheumatism.* In combination with antiseptics it is used in *rhinitis, tonsillitis, pharyngitis* and *aphthæ.*

*Internally.*—The liquor, carbonate and bicarbonate are used as antacids; they may be given in small doses before meals or in larger doses after meals in acidity and atonic dyspepsia. The acetate, citrate and bitartrate are used in the *uric acid diathesis* and in *acute articular rheumatism* as *antacids, diaphoretics* and *diuretics.* The acetate and citrate are much used in *febrile conditions* of children as diaphoretics and diuretics. The acetate in large doses and also the bitartrate are *efficient cathartics.* The bitartrate is very useful in *cardiac dropsies* and in *acute nephritis.* The citrate is valuable in *chronic Bright's disease.* The permanganate has its chief application as an *antiseptic*; in concentrated solutions it is mildly escharotic. It is used as a *deodorant* in *foul ulcers.* As an antiseptic it is used in *gonorrhœa* and *leucorrhœa* as an injection. Dilute solutions are useful in *bromidrosis.* It is used as an *antidote* in *morphine poisoning* and has been recommended in other alkaloids.

## RESORCINOL (RESORCINOL. RESORCIN).

**Source.**—A diatomic phenol and one of three isomers, being *meta-oxyphenol.* It is in the **form** of colorless, rhombic plates, odorless and neutral in reaction. Is **soluble** in water, alcohol, and ether. **Dose,** 5 to 15 grs. (0.30 to 1 gm.).

**Action and Uses.**—Originally introduced as an antipyretic it has fallen into disuse on account of the cardiac depression which it causes. The fall in temperature is fugacious and uncertain. It is also depressant to the nervous system. In full doses it causes fulness of the head with headache and tinnitus, slow and shallow respiration, while the pulse is weak and rapid. It is eliminated by the urine.

*Locally* it is used as an antiseptic in *cystitis, chronic otitis*

*media, foul ulcers, erysipelas,* and *purulent vaginal* discharges. Is efficient in skin diseases as *psoriasis, ptyriasis capitis, sycosis,* etc.

## RHEUM (RHUBARB).

**Source.**—The dried rhizome of *Rheum officinale* and other species of Rheum. A plant indigenous to China. It contains *chrysophan, chrysophanic acid, emodin, erythroretin, phæroretin,* and *aporetin* (all resins), *rheumic* and *rheotannic acids.*

### The Preparations of Rheum.

**Extractum Rhei** (**Extract of Rhubarb**).—**Dose,** 2 to 15 grs. (0.12 to 1 gm.).

**Fluidextractum Rhei** (**Fluidextract of Rhubarb**).—**Dose,** 5 to 30 ♏ (0.30 to 2 c.c.).

**Pilulæ Rhei Compositæ** (**Compound Pills of Rhubarb**).—Each contains 2 grs. (0.13 gm.) of rhubarb, 1½ grs. (0.10 gm.) purified aloes with myrrh and oil of peppermint. **Dose,** 1 to 3 pills.

**Pulvis Rhei Compositæ** (**Compound Powder of Rhubarb**).—Contains 25 per cent. of rhubarb with magnesia and ginger. **Dose,** ℥ss to ℥j (2 to 4 gm.).

**Tinctura Rhei** (**Tincture of Rhubarb**).—Contains 10 per cent. with cardamom. **Dose,** fl℥j to ij (4 to 8 c.c.).

**Tinctura Rhei Aromatica** (**Aromatic Tincture of Rhubarb**).—Contains 20 per cent. with cinnamon, cloves, and nutmeg. **Dose,** fl℥j to ij (4 to 8 c.c.).

**Mistura Rhei et Sodæ** (**Mixture of Rhubarb and Soda**).—Contains sodium bicarbonate, fluidextract of rhubarb, fluidextract of ipecac, glycerin and spirit of peppermint. **Dose,** for an adult, fl℥j to iv (4 to 16 c.c.); for a child, fl℥ss to j (2 to 4 c.c.).

**Syrupus Rhei** (**Syrup of Rhubarb**).—**Dose,** fl℥j to iv (4 to 16 c.c.).

**Syrupus Rhei Aromaticus** (**Aromatic Syrup of Rhubarb**).—**Dose**, fl℥ss to ij (2 to 8 c.c.).

**Action.**—In moderate doses rhubarb is a tonic, being stomachic and increasing intestinal secretion and peristalsis, causing soft, yellow-brown evacuations. Large doses are purgative; quiescence (constipation) follows its action and is due to the astringent effect of the rheotannic acid. It is readily absorbed and eliminated by the intestine, perspiration, urine and milk, the two latter are colored yellow, while the milk acquires laxative properties. Rhubarb on account of the griping which follows its use should not be given alone.

**Uses.**—It is used in the *summer diarrhœas* of children due to *irritation* from *indigestion* or *cold;* it is also used in *dysentery;* in *habitual constipation* small doses are very efficacious. It may also be used in *hemorrhoids* with constipation.

## SACCHARUM LACTIS (SUGAR OF MILK).

**Source.**—A peculiar crystalline sugar, obtained from the whey of cows' milk by evaporation, and purified by recrystallization.

Is a crystalline white powder, odorless and having a faintly sweet taste. It is **soluble** in water and **insoluble** in alcohol, ether, and chloroform. Its chief use is as a dilutant in the various preparations.

## SACCHARIN (BENZOSULPHINIDUM BENZOSULPHINIDE).

**Benzoylsulphonicimide. Source.**—A sweet imide derivative from toluene of coal-tar. It is a white powder, odorless and having an intensely sweet taste, about 500 times sweeter than sugar. It is **soluble** in 400 parts of water and its solutions are acid. With the alkaline hy-

drates or carbonates it forms saccharinates. It is non-toxic.

**Uses.**—Its chief use is as a sweetening agent, being used in *diabetes* where carbohydrates are contraindicated.

## SANTONICA (SANTONICA. LEVANT WORMSEED).

**Source.**—The dried, unexpanded flower heads of *Artemisia pauciflora*, collected in Turkestan. It contains about 2 per cent. of a glucoside called *santonin*, which is the active principle.

## SANTONINUM (SANTONIN).

The glucoside (inner anhydride or lactone of santonic acid). Colorless, shining, prismatic crystals, odorless, tasteless at first, afterward bitter; on exposure to light it turns yellow. Is nearly **insoluble** in cold water. It should be kept in amber bottles, away from light.

**Trochisci Santonini.**—Each contains $\frac{1}{2}$ gr. (0.03). **Dose,** 2 for a child and from 5 to 10 for an adult.

**Action and Uses.**—The chief use of santonin is as an anthelmintic in the expulsion of the round-worm (*Ascaris lumbricoides*). Ordinarily no untoward effects are seen, but occasionally either through idiosyncrasy or through overdosage it causes salivation, nausea and vomiting, abdominal pain and diarrhœa. It is readily absorbed as the santoninate of sodium and symptoms showing its absorption are headache, giddiness, xanthopsia, unconsciousness, and convulsions. The respirations during convulsions are labored. It is eliminated by the urine, which assumes a yellow color if acid and red or purple if alkaline, simulating the urine of hæmaturia. It may be administered alone or with calomel, and should be followed by an active cathartic some hours later.

## SCAMMONIUM (SCAMMONY).

**Source.**—A gum-resin from the living root of *Convolvulus scammonia,* a perennial of Syria and Asia Minor. **Dose,** 1 to 15 grs. (0.06 to 1 gm.). It consists largely of a resin, *jalapin,* identical with that of *jalap.*

**Resina Scammonii.**—**Dose,** 1 to 8 grs. (0.06 to 0.50 gm.).

**Action and Uses.**—Its action is the same as that of jalap, but it is more irritating to the intestine and causes much more griping. Large doses cause violent gastroenteritis. Its uses are the same as those of jalap.

## SCILLA (SQUILL).

**Source.**—The bulb of *Urginea maritima,* a plant indigenous to the basin of the Mediterranean. It contains *scillipierin, scillitoxin,* and *scillin.*

### The Preparations of Scilla.

**Acetum Scillæ (Vinegar of Squill).**—**Dose,** 10 to 30 ♏ (0.60 to 2 c.c.).

**Fluidextractum Scillæ (Fluidextract of Squill).**—**Dose,** 1 to 5 ♏ (0.06 to 0.30 c.c.).

**Syrupus Scillæ (Syrup of Squill).**—Contains 45 per cent. of the acetum. **Dose,** 30 to 60 ♏ (2 to 4 c.c.).

**Syrupus Scillæ Compositus (Compound Syrup of Squill. Hive Syrup).**—Contains 8 per cent. each of the fluidextracts of squill and senega, and 2 per cent. of tartar emetic or $\frac{1}{8}$ gr. (0.008 gm.) in ♎j (4 c.c.). **Dose,** ♎ $\frac{1}{4}$ to ij (1 to 8 c.c.).

**Tinctura Scillæ (Tincture of Squill).**—**Dose,** 5 to 20 ♏ (0.30 to 1.30 c.c.).

**Action.**—Squill in action resembles digitalis. Its action on the circulatory system is less powerful. It increases the

urine by increasing blood pressure and by stimulating the renal epithelium. It is eliminated by the kidneys and bronchial mucous membrane. It increases the bronchial secretions and small doses are expectorant.

**Poisoning.**—Large doses are irritating to the gastrointestinal tract and cause nausea, vomiting, abdominal pain, purging, while the urine is scanty, bloody or even suppressed; collapse and convulsions precede death.

**Treatment.**—Prompt emesis, demulcents for gastric irritation; diffusible stimulants to combat cardiac and respiratory depression.

**Uses.**—It is used as an *expectorant* in *chronic bronchitis* where either syrup may be used. Combined with digitalis it is very efficacious as a *diuretic* in *cardiac dropsy*, in *pericarditis* with effusion and in *chronic pleurisy*. It is *contraindicated* in *acute nephritis* and *cystitis*. As an emetic the compound syrup may be used, but at best is a dangerous remedy.

## SENNA (SENNA).

**Sources.**—The dried leaflets of *Cassia acutifolia* (Alexandrian senna) or *Cassia angustifolia* (Indian senna), small shrubs. They **contain** cathartic acid, a glucoside, and *chrysophanic acid*, both in combination with other bodies.

### The Preparations of Senna.

**Confectio Sennæ (Confection of Senna).**—**Dose,** ʒj to iij (4 to 12 gm.).

**Fluidextractum Sennæ (Fluidextract of Senna).**—**Dose,** fl ʒj to iv (4 to 16 c.c.).

**Infusum Sennæ Compositum (Compound Infusion of Senna. Black Draught).**—Contains 6 per cent. with manna and magnesium sulphate, each 12 per cent. and oil of fennel 2 per cent. **Dose,** fl ʒss to iv (15 to 120 c.c.).

**Pulvis Glycyrrhizæ Compositus** (**Compound Licorice Powder**).—Contains senna, 180; glycyrrhiza, 236; oil of fennel, 4; washed sulphur, 80; sugar, 500. **Dose,** ʒss to ij (2 to 8 gm.).

**Syrupus Sennæ** (**Syrup of Senna**).—25 per cent. **Dose,** fl ʒj to ij (4 to 8 c.c.).

**Action and Uses.**—Senna is an efficient purgative acting by irritation; it affects the entire bowel, increasing secretion and peristalsis; its action is accompanied with griping, which may be overcome by the use of antispasmodics, as the volatile oils. It operates in from three to eight hours.

The stools are copious, light in color, and liquid. It is absorbed and is eliminated by the urine and milk; to the latter it imparts its purgative properties; the urine is rendered red in color. It is **used** in the various forms of *constipation* from the ordinary simple to that of *fecal impaction* in the colon; its use is not followed by constipation. *Habitual constipation* is best treated with the compound licorice powder as is also the *constipation of pregnancy.*

## SERUM ANTIDIPHTHERICUM (ANTIDIPHTHERIC SERUM. DIPHTHERIA ANTITOXIN).

A fluid separated from the coagulated blood of a horse (*Equus caballus*), immunized through the inoculation of diphtheria toxin. It should be kept in sealed glass containers, in a dark place, at a temperature between 4.5° and 15° C. (40° and 59° F.).

A yellowish or yellowish-brown, transparent or slightly turbid liquid, odorless or having a slight odor due to the presence of the antiseptic used as a preservative.

The serum gradually loses its power, varying in a year from 10 to 30 per cent. Its label should state the strength of the antitoxin, expressed in antitoxic units, as well as the name and percentage by volume of preserv-

ative used, the date the antitoxin was last tested, and the date beyond which it will not have the strength indicated on the label. The average **dose** is about 3000 units.

## SINAPIS (MUSTARD).

**Sources.**—*Sinapis alba* is the seed of *Sinapis alba*, and *Sinapis nigra* is the seed of *Brassica nigra*. Both seeds are indigenous to Western Asia and Southern Europe, but are cultivated widely. White mustard **contains** a ferment, *myrosin*, and a glucoside, *sinalbin;* together in the presence of water they form *sinapine sulphate*, *glucose*, and *acrinyl sulphocyanate*, which is a colorless, non-volatile oil, the rubefacient and vesicating principle of white mustard. Black mustard contains the same ferment, *myrosin*, and *sinigrin* (*potassium myronate*); together in the presence of water they form *acid potassium sulphate*, *glucose*, and *allyl iso-thiocyanate*, a volatile oil to which its properties are due. This volatile oil is official as the **Oleum Sinapis Volatile** (**Volatile Oil of Mustard**). There are present also in both seeds an alkaloid, *sinapine*, *brassic acid*, and a *bland fixed* oil.

**Action and Uses.**—*Locally*, mustard is rubefacient and if the application be long continued, vesication results; in this it differs from other volatile oils. When first applied it causes a sense of warmth, followed by a burning, smarting pain, then by numbness, due to paralysis of sensory nerve endings. Internally by its irritant action it is an emetic; very large amounts cause a violent gastroenteritis.

**Uses.**—Mustard is preferred to cantharides where simple counterirritation is desired; in *pleurisy*, *pneumonia*, *acute bronchitis*, and *pericarditis* its action may be controlled by dilution with flour and length of application. The plaster is useful in *neuralgia*, *lumbago*, and its application to the epigastrium often relieves *vomiting*. *Colds* and *febrile conditions* may be treated by immersing the feet or legs in

mustard water (1 in 120). In *delayed menstruation* a mustard sitz-bath is often useful.

*Internally.*—It is a *condiment* and is used to *increase gastric secretion* and *motility*. It is chiefly used in medicine as an *emetic* in poisoning.

### The Preparations of Mustard.

**Charta Sinapis (Mustard Paper).**—Consists of black mustard (its fixed oil removed) mixed with gutta-percha solution and spread. A surface of sixty square centimetres should contain about 4 gm. of mustard.

**Oleum Sinapis Volatile.**—Is never used alone. It enters into liniments.

## SODA AND ITS SALTS.

The action of all sodium salts are similar to those of potassium, save that they are less depressing to the circulatory, muscular, and nervous systems, and are far less toxic. Similar in properties to potassa.

**Liquor Sodii Hydroxidum (Solution of Sodium Hydroxide.**—A 5 per cent. solution.

**Sodii Acetas.**—Similar to potassium acetate. **Dose** the same.

**Sodii Carbonas Monohydratus (Monohydrated Sodium Carbonate).**—Similar to potassium carbonate, except that it contains one molecule of water. Its properties are similar.

**Sodii Bicarbonas.** Similar to the potassium salt.

**Sodii Chloras.** Similar to the potassium salt.

**Liquor Sodii Chlorinatæ. Solution of Chlorinated Soda (Labarraque's Solution).** An aqueous solution of several chlorine compounds of sodium, containing at least 2.4 per cent. by weight of available chlorine. It is a pale-greenish liquid, having a faint odor of chlorine and a disagreeable alkaline taste. It should be kept in well-stoppered bottles away from light.

**Uses.**—As a disinfectant for foul ulcers, gangrenous sores, etc.

**Sodii Hypophosphis** (**Sodium Hypophosphite**).—Properties and uses similar to the potassium salt. **Dose**, 5 to 10 grs. (0.30 to 0.60 gm.).

**Sodii Thiosulphas** (**Sodium Thiosulphate**).—It and the hypophosphite are crystalline and **soluble** in water. They are feeble antiseptics. **Dose**, 5 to 30 grs. (0.30 to 2 gm.). Their chief **use** is in treatment of skin diseases as *scabies, favus, sycosis*, etc. Inhaled in *fetid bronchitis* the thiosulphate does good.

**Sodii Nitras** (**Sodium Nitrate**).—Its properties, action, and uses are similar to the potassium salt.

**Sodii Phosphas** (**Sodium Phosphate**).—Large, colorless crystals, odorless and having a cooling, saline taste. They slowly effloresce in air, and are **soluble** in water, **insoluble** in alcohol. **Dose**, ʒj to ℥j (4 to 30 gm.).

**Sodii Sulphas** (**Sodium Sulphate**).—Large, colorless, or granular crystals, odorless and having a bitter, saline taste. They effloresce rapidly; are **soluble** in water, **insoluble** in alcohol. **Dose**, ʒj to ℥j (4 to 30 gm.).

The phosphate and sulphate are **used** as cathartics (salines) in *habitual constipation*. The phosphate is used extensively in *catarrhal conditions* of the bowel and *catarrhal jaundice*. The sulphate resembles magnesium sulphate in its action, but is more irritating.

## STROPHANTHUS (STROPHANTHUS).

**Source.**—The ripe seed of *Strophanthus kombé*, deprived of its long awn; it is a climbing woody creeper of Africa. From it is prepared the *kombi* arrow poison of the natives. Its chief active principle is *strophanthin*, a glucoside.

### The Preparation of Strophanthus.

**Tinctura Strophanthi** (**Tincture of Strophanthus**).—10 per cent. **Dose**, 2 to 10 ♏ (0.12 to 0.60 c.c.).

**Action.**—In its action it resembles digitalis exactly; is somewhat quicker, but more fugacious. It is claimed that strophanthus does not constrict the arterioles; this is a question which must still be considered *sub judice*. The evidence seems to be in favor of arteriolar constriction produced in the same manner as that produced by digitalis. Its uses are those of digitalis; it is advisable often to use them interchangeably for reasons such as the avoidance of cumulative effect in digitalis—or the gastric irritability which digitalis causes. Again, the effects of either are enhanced by interchanging.

## SULPHUR AND ITS PREPARATIONS.

**Sulphur Sublimatum** (**Sublimed Sulphur**).

**Sulphur Præcipitatum** (**Precipitated Sulphur**).—Sublimed sulphur is boiled with *slaked* lime; the resulting sulphide and hyposulphite are decomposed with HCl, the sulphur precipitating as a fine amorphous powder.

**Sulphur Lotum** (**Washed Sulphur**).—Sublimed sulphur is digested with ammonia water, filtered, drained, and dried. It enters into pulvis glycyrrhizæ compositus. **Dose,** 15 to 60 grs. (1 to 4 gm.).

**Pulvis Glycyrrhizæ Compositus.**—See Senna.

**Unguentum Sulphuris.**—Contains 15 per cent. of washed sulphur.

**Action and Uses.**—Sulphur itself is inert and the greater part taken passes out unchanged in the feces; some of it is converted into the sulphide and this by irritation increases secretion and peristalsis acting as a laxative. Some of it is absorbed as the sulphide and is eliminated by the lungs and skin in sufficient quantity to impart a disagreeable odor; it is also eliminated by the kidneys, chiefly as the sulphate.

**Uses.**—*Externally* in *parasitic* skin diseases; also in *impetigo, sycosis, acne, infiltrated eczema, psoriasis,* etc.

*Internally* it may be used in *habitual constipation,* in *constipation* with *hemorrhoids,* in *anal fissure.* It is used as a *laxative* and *alterative* in *chronic rheumatism, muscular rheumatism, sciatica.*

## TEREBINTHINA (TURPENTINE. CRUDE TURPENTINE).

**Sources.**—A concrete oleoresin obtained from *Pinus Palustris* and other species of *Pinus.* Habitat, Southern United States.

## TEREBINTHINA CANADENSIS (CANADA BALSAM, BALSAM OF FIR).

**Source.**—A liquid oleoresin obtained from *Abies balsamea.* From each there are obtained by distillation a volatile oil, official as **Oleum Terebinthinae** (**Oil or Spirit of Turpentine**) and a resin official as **Resina** (**Rosin**). Oil of turpentine is a mixture of several terpenes, chief among which are pinene, dipentene, and phellandrene. In its general action oil of turpentine resembles that of the volatile oils but is more irritating; if enough be applied it is even vesicant.

### The Official Preparations of Terebinthina.

**Oleum Terebinthinæ.**—**Dose,** ♏j to v (0.06 to 0.30 c.c.). As an anthelmintic, f℥ to ℥ss (4 c.c. to 15 c.c.).

**Oleum Terebinthinæ Rectificatum** (**Rectified Oil of Turpentine**).—**Dose,** same.

**Linimentum Terebinthinæ.**—Composed of resin cerate and oil of turpentine.

**Uses.**—*Locally* it is used as a counterirritant in *bronchitis* and *pleurisy;* applied in the **form** of a *stupe* (cloths rung out in hot water and impregnated with the oil), applied in abdominal pain and in the *tympanites* of *typhoid;* or it may be used as an *enema* for the same condition. The lini-

ment may be employed with friction in *lumbago, rheumatic pains, neuralgia,* etc.

*Internally.*—For its *stomachic* and *carminative properties;* as a diffusible stimulant in *exhausting fevers;* in *subacute* and *chronic bronchitis* it may be taken internally or inhaled as a vapor from the surface of hot water. It is used as an *anthelmintic* in *tape-* and *seat-worms;* it is generally given emulsified with acacia and followed by a cathartic, as castor oil. As an anthelmintic there is an element of danger in the large doses (4 to 15 c.c.) which are required in order to render it efficient. The remedy is at best unpleasant for internal administration and it is used but seldom.

## TERPIN HYDRATE.

The hydrate of the diatomic alcohol *Terpin,* obtained by distilling oil of turpentine with an alkali, or by the action of nitric acid on oil of turpentine in the presence of alcohol. It **forms** colorless, lustrous, rhombic prisms, nearly odorless, having a slightly aromatic, somewhat bitter taste. It is soluble in 10 parts of alcohol and in 250 parts of water. **Dose,** 10 to 15 grs. (0.60 to 1 c.c.).

**Action and Uses** are the same as Turpentine; it is more feeble.

## VALERIANA (VALERIAN).

**Sources.**—The dried rhizome and roots of *Valeriana officinalis,* an herbaceous perennial of Europe; cultivated in New England and elsewhere. It **contains** from 1 to 2 per cent. of a volatile oil, odorless when fresh. It contains esters of *acetic, formic,* and *valerianic acids* and a *camphor.* Oxidation converts the esters into their respective acids.

### The Official Preparations of Valerian.

**Fluidextractum Valerianæ (Fluidextract of Valerian).**—**Dose,** 15 to 60 ♏ (1 to 4 c.c.).

**Tinctura Valerianæ** (**Tincture of Valerian**).—**Dose**, fl℥j to ij (4 to 8 c.c.).

**Tinctura Valerianæ Ammoniata** (**Ammoniated Tincture of Valerian**).—Made by using aromatic spirits of ammonia as a menstruum instead of alcohol. **Dose**, 15 to 60 ♏ (1 to 4 c.c.).

**Valerianic Acid** is not official but its salts are.

**Ammonii Valeras** (**Ammonium Valerate. Ammonium Valerianate**).—Colorless or white quadrangular plates, with the odor of valerianic acid; it has a sharp, sweetish taste and is very deliquescent in moist air. Soluble in water and in alcohol. **Dose**, 2 to 10 grs. (0.12 to 0.60 gm.).

**Zinci Valeras** (**Zinc Valerate. Zinc Valerianate**).—White, pearly scales, having the odor of valerianic acid and a sweet, astringent and metallic taste. **Soluble** in 10 parts of water and in 40 parts of alcohol. **Dose**, 1 to 5 grs. (0.06 to 30 gm.). All the valerianates lose their valerianic acid and should be kept in well-stopped bottles.

**Action.**—Any action which valerian may have is due to the presence of its volatile oil. (See Volatile Oils.) Valerianic acid is without any action save that which its odor might induce. The salts are but little used.

**Uses.**—Valerian may be used in *hysterical conditions* of all kinds; in *nervous headache*, and *coughs*, *hypochondriasis;* it also may be used as a *carminative* in *hysterical flatulence.* It should be tried in *diabetes mellitus* and *insipidus.* It has been used in the *delirium* of *low fevers* with some success.

## VERATRUM (HELLEBORE AND VERATRINE).

**Sources.**—*Veratrina* is a mixture of alkaloids obtained from the *Asagræa officinalis.* Habitat, Mexico. The chief alkaloid is *veratrine.*

**Veratrum. Veratrum Viride** (**American Hellebore**).—The dried rhizome and roots of *Veratrum viride.* Habitat,

United States. The chief alkaloid is *veratrine* (*cevadine*), along with *pseudojervine*, *jervine*, and *rubijervine*, all weak in their action.

**Action.**—Veratrine in its action resembles aconite in every detail excepting its effect on muscle, which is of little value in practice. Its toxicology is also identical, and treatment is the same.

### The Official Preparations of Veratrum.

**Fluidextractum Veratri** (**Fluidextract of Veratrum**).—**Dose**, 1 to 5 ♏ (0.06 to 0.30 c.c.).

**Oleatum Veratrinæ** (**Oleate of Veratrine**).—2 per cent. Is made from veratrina. Used externally.

**Tinctura Veratri** (**Tincture of Veratrum**).—10 per cent. **Dose**, 5 to 10 ♏ (0.30 to 0.60 c.c.) or more.

**Unguentum Veratrinæ** (**Veratrine Ointment**).—4 per cent. Is made from veratrina. Used externally.

**Uses.**—Veratrum viride. Its uses are identical with those of aconite. It is considered a safer drug than aconite for the reason that in large doses it causes emesis, thus avoiding toxic effects. It is highly lauded in *puerperal eclampsia*. Veratrina is used externally in *rheumatic pains* and in *neuralgia*.

## VIBURNUM PRUNIFOLIUM (BLACK HAW).

**Sources.**—The dried bark of *Viburnum prunifolium*, a tall shrub indigenous to the United States. It **contains** a bitter resin and *viburnin*, a bitter principle, glucosidal in character, associated with it.

**Fluidextractum Viburni Prunifolii** (**Fluidextract of Viburnum Prunifolium**).—**Dose**, f℥½ to j (1 to 4 c.c.). Its uses are the same as those of—

## VIBURNUM OPULUS (CRAMP BARK).

**Source.**—The dried bark of *Viburnum opulus*, a small tree of North America and Northern Europe. It contains *viburnin*.

### The Official Preparation of Viburnum Opulus.

**Fluidextractum Viburni Opuli (Fluidextract of Viburnum Opulus).**—**Dose**, fl$\frac{1}{4}$ to j (1 to 4 c.c.).

**Action and Uses.**—There is but little known about their action; it has been observed that they are antispasmodic and seem to have a special influence on the uterus in various spasmodic conditions, as *dysmenorrhœa, menorrhagia, nervous disturbances* of the *climacteric, threatened abortion, postpartum pains*, etc.

## ZINCUM (ZINC) AND ITS SALTS.

Zinc itself is not used in medicine, but nine of its salts are.

**Zinci Acetas.**—Soft, white pearly plates, having a faint acetous odor and an astringent, metallic taste. It is **soluble** in water and alcohol. **Dose.**—It is occasionally used *internally* as a tonic in doses of $\frac{1}{2}$ to 2 grs. (0.03 to 0.12 gm.). Its chief use is *externally* as an injection in *gonorrhœa, leucorrhœa*, and in *conjunctivitis*.

**Zinci Carbonas Præcipitatus.**—An impalpable, white powder of uncertain composition, odorless and tasteless. It is **insoluble** in water and alcohol. It is **used** *externally* in various skin diseases, as *weeping eczema, intertrigo;* it is also used as a dusting powder.

**Zinci Bromidum.**—A white, granular powder, odorless and having a sharp, saline, and metallic taste. It is **soluble** in water and alcohol. **Dose**, 1 to 5 grs. (0.06 to 0.30 gm.). Its use is that of the bromides.

**Zinci Chloridum.**—A white, granular powder, or irregular, porcelain-like masses, or moulded into pencils; it is odorless.

Diluted it has an astringent, metallic taste, while strong it is very caustic and painful. It is used as a caustic and as such its action is very painful; it penetrates deeply. Diluted, it is astringent and disinfectant. Internally, unless much diluted, it is a violent gastrointestinal irritant. It is used as a *caustic* in *syphilitic ulcers, morbid growths, lupus,* etc. Weak solutions are used as injections in *gonorrhœa* and *leucorrhœa.* Fifty per cent. solutions are used for *cleansing putrid cavities, ulcers,* etc.

**Zinci Iodidum.**—A white, granular powder, odorless, having a sharp, saline, and metallic taste. It is very deliquescent and liable to absorb O from the air, becoming brown from liberated iodine. It is soluble in water and alcohol. **Dose,** $\frac{1}{2}$ to 2 grs. (0.03 to 0.12 gm.). It is but little used; occasionally as a local stimulant to *enlarged tonsils, scrofulous glands;* it may be used in *gonorrhœa* as an injection.

**Zinci Sulphas.**—Colorless, transparent, rhombic crystals, odorless and having an astringent, metallic taste. It is efflorescent in dry air. It is **soluble** in water and glycerin; **insoluble** in alcohol. **Dose,** 1 to 3 grs. (0.06 to 0.18 gm.); as an emetic, 10 to 60 grs. (0.60 to 4 gm.).

**Zinci Oxidum.**—An odorless and tasteless, white powder insoluble in water and alcohol. **Dose,** $\frac{1}{6}$ to 5 grs. (0.01 to 0.30 gm.).

**Unguentum Zinci Oxidi.**—20 per cent. Used externally.

**Oleatum Zinci.**—5 per cent. Used externally.

**Zinci Phosphidum** (**Zinc Phosphide**).—A gritty powder of a dark-gray color, or crystalline fragments of a dark, metallic lustre, having a faint odor and taste of phosphorus. In contact with air it slowly emits phosphorus vapor. It is insoluble in water and alcohol. **Dose,** $\frac{1}{20}$ to $\frac{1}{2}$ gr. (0.003 to 0.03 gm.).

**Zinci Valeras** is described under Valerian.

**Action.**—Excepting the bromide, iodide, chloride, phosphide and valerianate, which partake of the characters of

their respective acid. The salts of zinc when *externally* applied to the skin are astringent, acting by precipitating the albumin of the tissues. The acetate and sulphate are most active while the oxide and carbonate are very weak in their action. They are all mild hæmostatics. *Internally*, large doses of the sulphate, and carbonate to a lesser degree, act as emetics, and produce but little depression. Very large doses of the sulphate produce gastroenteritis.

**Uses.**—The oxide is used externally as an ointment or dusting powder in *eczema* and other *skin diseases;* in *anal fissure, burns, intertrigo*, etc. Internally it is used in *diarrhœas* of a *catarrhal* or *membranous* type; also in *dysentery.* It is used to check *colliquative sweats;* it has been used in *epilepsy, chorea, hysteria,* and *spasmodic asthma.* Also in *whooping-cough* and *delirium tremens.*

Zinc sulphate may be used externally in *weeping eczema* and *pruritus;* in solution it is useful in *conjunctivitis* and *ophthalmia;* as an injection in *gonorrhœa, leucorrhœa,* and *vulvitis.* As an *emetic* it is safer than copper sulphate and generally preferred. It is used as an astringent in *diarrhœas* and *dysentery,* generally with opium. It has been used in *flatulent dyspepsia, spasmodic asthma, whooping-cough, hysteria, chorea,* and *epilepsy.*

## ZINGIBER (GINGER).

**Sources.**—The dried rhizome of *Zingiber officinalis,* a perennial herb of tropical Asia, but cultivated in most tropical countries. It contains 1 to 2 per cent. of a volatile oil and also a resin to which its pungency is due.

### The Official Preparations of Zingiber.

**Fluidextractum Zingiberis (Fluidextract of Ginger).**—**Dose,** 10 to 30 ♏ (0.60 to 2 c.c.).

**Oleoresina Zingiberis** (**Oleoresin of Ginger**).—**Dose,** 1 to 3m (0.06 to 0.18 c.c.).

**Syrupus Zingiberis** (**Syrup of Ginger**).—**Dose,** ½ to 2 fl3 (2 to 8 c.c.).

**Tinctura Zingiberis** (**Tincture of Ginger**).—**Dose,** 1 to 2 fl3 (4 to 8 c.c.).

**Action and Uses.**—The action of ginger is identical to that of other volatile oils. It is used as a *stomachic* and *carminative* for the relief of *flatulency* and *colic*. It is also used as a corrective to cover the taste of other medicines as well as to modify the action of cathartics.

QUESTIONS ON DRUGS AND THEIR PREPARATIONS.

Acacia. What is its source and composition?

What advantages has the granular over the powdered for purpose of preparing emulsions?

What is its solubility; do aqueous solutions keep? If not, what substance is formed?

What are its uses?

Acetanilidum. What is its source, form, solubility, and dose?

Mention the untoward results which are liable to follow overdosage or idiosyncrasy.

What are its effects on the blood; on the circulation; nervous system; temperature?

What are its therapeutic indications?

Is there any difference in the action between phenacetin, antipyrin, and acetanilid?

Which is the safest of the three?

Which is water soluble?

Externally what action has antipyrin?

What are the doses of the three?

Acidum Aceticum. How many forms are there?

What are their strengths and the therapeutic indications of each?

Acidum Boricum. What is its source, solubility, dose, and therapeutic application?

What is borax? State its official title, and how does it differ from Boric Acid? What are its uses?

Acidum Carbolicum. What are its possible sources and what is its form when pure?

Would its degree of hydration influence its solubility in water?

What is the action of carbolic acid?

What are the symptoms of poisoning and what is the treatment?

What are its preparations and uses?

What is the form of sodium sulphocarbolate?

What are its therapeutic applications?

Acidum Chromicum. Is it an acid?

What is its form?

What are its effects and uses?

What caution should be exercised in its use and combination?

Acidum Citricum. What are its form, solubility, action, and uses?

Acidum Hydrocyanicum. What are its sources, strength, properties, action, dose, and uses?

What is the treatmeat for poisoning?

Acidum Hydrochloricum. What is the strength of the concentrated? The diluted?

What are their doses and uses?

Acidum Nitricum. What is its action internally? Externally?

What is the dose of the strong acid? The dilute? How should they be administered?

Acidum Nitrohydrochloricum. What does it contain?

What is the strength of diluted nitrohydrochloric acid? What is it used for?

Acidum Sulphuricum. How many preparations of sulphuric acid are there? Which is used most, and for what purpose?

Is there any similarity of action between the acids internally? Is their external action the same?

What are the symptoms and treatment of poisoning by the strong acids?

What is lactic acid?

What are its effects and uses?

Acidum Salicylicum. What are its sources, characters, solubility, action, and uses?

What is Oleum Gaultheria?

How does it differ from salicylic acid, methyl salicylate, and oil of sweet birch?

May they be used interchangeably?

Salol. What is its composition?

What danger is there from overdosage?

What are its therapeutic applications?

Acidum Tartaricum. What is the source, form, solubility, dose, and therapeutic application? Is there any similarity of action between it and citric acid? Between it and the action of the dilute mineral acids?

What common preparation does it enter?

Aconitum. What is it, and what is the nature of its active principle?

What is the first symptom of aconite poisoning? What other symptoms follow?

What are its effects on the circulation and how does it cause cardiac inhibition?

How does it lower temperature?

What are its therapeutic applications?

What are the preparations in common use?

Adeps Lanæ Hydrosus. What is its source, form, and what advantages has it over other fatty substances as a basis for ointments?

Ether. What is ether? What are the symptoms of ether inhalation?

What is its action on the central nervous system? Which portion is last to succumb to its influence?

Internally what are the affects of ether?

What are its preparations and uses?

Chloroformum. What is it? What are its properties?

Compare the physiological effects of ether and chloroform.
What advantages has each comparatively?
What are the preparations of chloroform, their doses and uses?
Give some important details in producing anæsthesia.
What is to be done when toxic symptoms appear during the administration of ether?
Alcohol. How is alcohol formed? How many strengths of alcohol, as such, are official?
What is the strength of the official Wines? Brandy? Whiskey?
What are their physiological effects?
What is the treatment of acute alcoholism?
What are the symptoms of chronic alcoholism? What is the treatment for the condition?
What are the therapeutic indications for alcohol?
Aloe. What is it? What is its active principle and what is its nature?
What are the effects and therapeutic indications of aloes?
What are its preparations? State their doses.
Alumen. What is it? What are its preparations?
What is its action and what are its uses?
Ammonia. What is it? How many strengths are there official?
What are the preparations of ammonia? What are their uses?
What are the uses of ammonium chloride?
Amyl Nitris. What is it? What is its action? What is the dose and what are its therapeutic indications?
Compare the action of amyl nitrite with that of nitroglycerin and other nitrites. What advantages have they over amyl nitrite?
What is the action of spiritus ætheris nitrosi? What are its uses?
Antimonium. What are the preparations of tartar emetic? What are their uses?
What is the toxicology and treatment of tartar emetic?
Aqua Hydrogenii Dioxidi. What is it? What are its uses?
Argentum. What is it? What are its preparations? Their properties? Their uses? Their doses?
Arsenum. What is it? What is arsenous acid? What is its form? Dose?
What are its preparations? Doses?
What is Arseni Iodidum? What preparation is made from it?
What is the strength of this preparation?
What is Sodii Arsenas? What preparation is made from it? What is its strength? Doses?
What is the action of these different forms and preparations of Arsenum? What is their toxicology and treatment?
What are their therapeutic indications?
Asafœtida. What is Asafœtida?
What is its active principle?
What are its preparations? State their doses? What is their action?
What are the therapeutic indications for the drug?
Aspidium. What is it? On what does its value depend?
What preparation is made from it? What is the dose? What are the therapeutic indications?
Is there any danger from overdosage?
Aurantium. What is it?
What is contained in it? What are its preparations?
What are its uses?

What are the applications of the aurantium preparations?
Balsamum Peruvianum. What is it?
What is its form? What is contained in it?
Balsamum Tolutanum. What is it? What is contained in it?
Benzoinum. What is it? What is contained in it?
Acidum Benzoicum. What is its source?
What are the therapeutic indications of the balsams and benzoic acid?
Belladonna. What is it? How many parts of the plant are official?
What are its preparations? State their doses.
What active principle is contained in belladonna? Does it represent the drug medicinally? What substance is prepared from this active principle? Does it differ in its action in any manner from that of the active principle?
What is the action of belladonna on the nervous system?
What is the action on secretion?
State the manner in which this is accomplished.
What is the action of belladonna on the eye? How is this accomplished? Can this result be accomplished by internal administration? What is the effect on circulation?
What is the effect on respiration? How does belladonna kill?
Hyoscyamus. What is it? What are its preparations? State their doses.
What active principles are contained in hyoscyamus?
What is their doses?
Stramonium. What is it? What are its preparations? What are the doses?
What active principles are contained in it?
Is there any resemblance in the active principles of belladonna, hyoscyamus, and stramonium?
Which of the three drugs is most deleriant? Which most sedative?
What are the symptoms of overdosage?
What is the first symptom?
What are the therapeutic indications of these three drugs?
What is scopolamine?
Bismuthum. What are the preparations? What are their doses and therapeutic indications?
Bromum. What is it? Is it used as such in medicine?
What are the preparations? State their doses.
What is the action? What are the therapeutic indications?
Caffeina. What is it? What is its form?
What are its preparations? State their doses.
Theobromina. What is it? What is its form? Dose?
What combination of theobromine is used most?
What is the action of caffeine on the circulation?
What is the action on the cerebrum?
How does caffeine cause diuresis?
How does theobromine differ in its action from caffeine?
What are the therapeutic indications of both?
Calcium. Is it used as such in medicine? What preparations are used?
What are their uses?
Camphora. What is it? What is its solubility? What are its preparations? What great class of substances does camphor in its action resemble?
What are the therapeutic indications for camphor?
Cannabis Indica. What is it? What are its preparations? What are their doses?

Are the preparations variable?
What are the effects produced by cannabis indica?
What are the therapeutic indications?
Cantharis. What is it? On what does its activity depend?
What are the preparations? State their doses.
What is the action and what are the therapeutic indications?
Gambir. What is gambir? On what does its value as a medicinal substance depend?
What are its preparations? State their doses.
What are the therapeutic indications?
Cerii Oxalas. What is it? What are its uses? What is its dose?
Chloral. What is it? What is its form? What is its solubility? Dose? Any preparations? On what system does this drug exert its greatest influence in medicinal doses?
What is the toxicology of this drug? What is the treatment?
What do you understand by chloralism?
What are the therapeutic indications for this drug?
Cinchona. What is it? How many kinds are official? What are the pharmacopœial requirements?
What are the active principles contained in cinchona?
What are the preparations? Doses? How many salts of quinine are official? What are their doses?
What other alkaloids of cinchona are official? Doses?
What is the action of quinine on the cerebrum? On the circulation? On the blood? Has quinine any effect on normal temperature?
What is cinchonism?
In what conditions is quinine contraindicated?
What are the therapeutic indications?
Coca. What is it? What is its chief principle? What is its nature? Dose? What is the action of coca internally? What is the action of its principle internally and externally?
What are its preparations? Doses?
What are the therapeutic indications of coca? Of those of the principle? Is there danger of a habit? What are symptoms of acute poisoning? Treatment? What are the symptoms of chronic poisoning? What is the treatment? What are the therapeutic indications?
Colchicum. What is colchicum? What is the principle constituent? Dose?
What are the preparations? Doses?
What are the effects of colchicum poisoning?
What are the therapeutic indications?
Collodium. What is it? What is its form?
What are the preparations of collodium? Uses?
Copaiba. What is it? What is its form? What are the preparations? Doses?
What is its action? What are the therapeutic indications?
Creosotum. What is it? What is its form? Properties? Dose?
Is there any latitude in the dosage?
What are the preparations? Doses?
What is the action of creosote?
What are its therapeutic indications?
Cubeba. What is it and what active principles does it contain?
What are the preparations? Doses?
What are the action and therapeutic indications?

Cuprum. What salt of cuprum is used most extensively? What are its form and properties? What are its action and uses? Dose?

Digitalis. What is it? What are the active principles and what is their nature?

What are the preparations of digitalis? Doses?

Are any of the active principles used? Doses?

What are the symptoms produced by large doses of digitalis?

What part of the central nervous axis is most affected by digitalis?

How are the circulatory effects produced?

Explain why digitalis produces vomiting?

How does it cause diuresis?

What are the therapeutic indications of the drug?

What is the treatment for digitalis poisoning?

Ergota. What is it? What are the preparations? Doses? Why are none of the principles isolated used instead of the preparations of the crude drug? What is the action of ergot on the circulatory apparatus?

What system is most profoundly affected by ergot?

What are the therapeutic indications?

Ethyl Chloride. What are its uses?

Eucalyptus. What is eucalyptus? What is contained in it? What is eucalyptol?

What are the preparations? Doses?

What are its therapeutic indications?

Ferrum. What preparations are there? Doses?

What are the action and therapeutic indications?

Formaldehyde. What is it? What are its action and uses?

Frangula. What is it? What active principle does it contain? What preparation is there of it? Dose?

Rhamnus Purshiana. What is it and what active principle does it contain? What preparations are there of it? What is the action of both frangula and rhamnus purshiana? Why should both of them be at least one year old before using? What are their therapeutic indications?

Galla. What are they? What is their form? On what contained principle does their activity depend?

What preparations are there? Doses? Uses?

Acidum Tannicum. What is its form? Solubility? Dose?

What are the preparations?

What is the action of tannic acid?

What are its therapeutic indications?

Acidum Gallicum. What is its source? Form and properties? Dose?

What is its action and how does it differ from that of tannic acid?

What are its therapeutic indications?

Gentiana. What is gentian and what are its preparations? Doses?

What are its action and therapeutic indications?

Glycerinum. What is it and what is its source? What are its preparations?

What is its action? What are its therapeutic indications?

Glycyrrhiza. What is it? What does it contain and what is the nature of this principle? What are the preparations? Doses?

What are the uses of this agent?

Guaiacum. What is it? What does it contain? On which does its medicinal activity depend?

What are the preparations? Doses?

What are its therapeutic indications and uses?

Guaiacol. What is it? What are its sources? Properties? Dose? What are its therapeutic indications?

Hydrargyrum. What are the preparations? Doses?

What is the action? What are the symptoms of acute poisoning? What is the treatment? What are the symptoms of chronic poisoning?

What is the treatment? What are the therapeutic indications?

Hydrastis. What is hydrastis? What active principles does it contain? What are its preparations? Doses?

What is hydrastinine? What salt is used? Dose?

What is the action of hydrastis? What are the therapeutic indications?

Ichthyol. What is it? What is its source? Properties? What combination of it is used?

What are its therapeutic indications?

Iodum. What is its source and what are its properties?

What are its preparations? Their doses?

What are the effects of iodine preparations? What are their therapeutic indications?

What are the effects of the iodides when administered?

What are their therapeutic indications?

Iodoformum. What are its properties? Action? Uses?

Ipecacuanha. What active principles does it contain? What preparations are there?

What are their doses?

What is the action of ipecacuanha? What are the therapeutic indications?

Jalapa. What is jalapa and what is its active principle?

What are the preparations? Doses?

What are the action and therapeutic indications of jalap?

Kino. What is it? On what substance does its activity depend?

What are its preparations? Doses?

What are its therapeutic indications?

Limomum. What is limomum? What parts of it are official? What are contained in these parts which render them of value in medicine?

What are their uses in medicine?

Linum. What is linum? What is contained in it? Which is official? What are its uses? What preparation is there of this substance? Is it official? What are its uses in medicine?

What are the therapeutic indications of linum?

Lithium. What are the preparations of lithium? What are the doses and the therapeutic indications?

Magnesia. What are the preparations? Doses?

What are the action and therapeutic indications?

Mentha Piperita. What is it? What is its chief principle on which its value depends? What valuable substance is derived from it? What is the nature of it? Its properties? Doses?

What is their action? Is there any difference between them in their action? What are their therapeutic indications?

Naphtalinum. What is its source? What is its nature? What are its properties? Dose?

Naphtol. What is its source? Form and properties? Dose?

What are the therapeutic indications?

Nux Vomica. What is it? What are its active principles?

What are the preparations of nux vomica? Doses?

Which is the most important of the active principles of nux vomica?

What are its properties? Dose? Does this active principle represent the drug?

What system is most profoundly affected by nux vomica? What is the action of nux vomica in general on all the systems of the body?

What is the toxicology of nux vomica? Treatment?

What are the therapeutic indications?

Olea Volatila. What are they? What is their physical composition? What elements do they contain? What is their color due to? When pure what is their color? As a class what is their solubility? Group dose?

As a class what is their action in small doses? Large doses?

Oleum Amygdalæ Amaræ. What is it? How is it formed? What is its composition? Dose?

What are its uses in medicine?

Oleum Gossypii Seminis. What is it and what is its composition?

What are its uses in medicine?

What preparations does it enter?

Oleum Morrhuæ. What is its source? What is its composition? On what does its composition largely depend? What are its uses? Dose?

Oleum Olivæ. What is its source and composition? What are its uses?

Oleum Ricini. What is its source and composition? Upon what fact does its action depend? What are its uses and dose?

Oleum Tiglii. What is its source and composition? Upon what fact does its action depend? What are its therapeutic indications? Dose?

Oleum Theobromatis. What is its source? Form? Properties and uses?

Oleum Thymi. What is its source and what principle does it contain? What is the nature of this principle? What is its form? Solubility? Dose?

What is its action? What are its therapeutic indications?

Opium. What is it? Mention its alkaloids in the order of their importance? What are the preparations of opium? What are their strengths? Doses?

Which is the most soluble alkaloid of opium? What is the most soluble salt of morphine? What salts of morphine are official? What is the dose of morphine? Of its salts? Is there any difference?

Into what preparations does morphine enter?

What is apomorphine? Which salt of it is used? What is its dose?

What is the dose of codeine? What is heroin? What is its dose?

What is the action of opium? What is the action of apomorphine?

What are the therapeutic indications of apomorphine?

How does codeine differ in its action from morphine? How does heroin differ from codeine? How do the other alkaloids of opium act in comparison?

What are the toxicology and treatment?

What are the therapeutic indications?

Nitrous Oxide. What is it? What is its action? What are its uses?

Pancreatinum. What is it? To what substances is its activity due? What is the nature of these substances? What are the form and properties of pancreatin?

What are the dose and therapeutic indications?

Papain. Mention some synonyms? What is its source? What are its dose and therapeutic indications? Mention some of its properties?

Pepsinum. What is it? What are its form and properties? What preparation is there of it? Doses? What are its therapeutic indications?

Phosphorus. What preparations are there? What are their doses?

What is the action of phosphorus? What are the toxicology and treatment? What are the therapeutic indications?

Physostigma. What is it? What is the nature and what are the active principles contained in physostigma? Are any of these in use? If so, what are their doses and therapeutic indications?

What are the preparations of physostigma? Their doses?

What is the action of the drug? What are its toxicology and treatment? What are its therapeutic indications?

Pilocarpus. What is pilocarpus? What is the nature and what active principles are contained in it?

What are the preparations of the drug? Doses?

Are any of its active principles in use? If so, mention and state dose.

What is the action of pilocarpus? What are the therapeutic indications?

Plumbum. What salts of lead are official? What are the preparations of these?

What are their doses if used internally?

What is their action? Are the constitutional effects dependent upon any particular form or combination of lead or in its administration externally or internally?

What are the symptoms of acute poisoning? Its treatment?

What are the symptoms of chronic poisoning? Its treatment?

What are the therapeutic indications?

Podophyllum. What is it? What is its active principle and what is it in turn composed of? What are the preparations? Their doses?

What are the action and therapeutic indications?

Potassa. What preparations are official? What are their uses?

Potassium. Name the different salts of potassium? What are their doses? What are their actions? What is their toxicology? The treatment?

What are their therapeutic indications?

Resorcin. What is it and what is its form? What are its properties? Dose?

What are its action and uses?

Rheum. What is rheum? What principles does it contain? What are its preparations? What are their doses?

What are the therapeutic indications of the drug?

Santonica. What is it? What is its active principle? What is its nature? What are its properties and dose? What preparation is there of it? What are the therapeutic indications?

What are the methods of its administration?

Scammonium. What is it? What is it largely composed of?

What preparation is official? What is the dose?

What are the action and uses of the drug?

Scilla. What is it and what are its active principles?

What are its preparations? Their doses?

What is the action of scilla? What other drug does it resemble in most respects? What is the toxicology of scilla? Treatment?

What are the therapeutic indications?

Scoparius. What is the action of the drug.

What are the uses in medicine?

Senna. What is it? Upon what principle does its activity depend? What is the nature of the active principle?

What are the preparations of senna? What are their doses?

What are the action and therapeutic indications of the drug?

Sinapis. What is it? How many kinds are there? What are contained in each?

What active principles are formed from each?

What is oleum sinapis volatile? What is its chemical composition? Is it official? Is it used internally?

What preparations are there of it? Are they official?

What are the uses of sinapis?

Soda. What preparation is there of it?

Sodium. What salts of sodium are official? What are their doses? Their uses?

How do the salts of sodium compare in their action with those of potassium? Are their therapeutic indications the same?

Strophanthus. What is it? What active principle does it contain?

What preparation of strophanthus is there official? What is the dose?

What are the action and therapeutic indications of the drug?

Suprarenal Glands. What is their action? How does it differ from that of digitalis?

What are the conditions in which it has been applied therapeutically?

Terebinthina. What is its source? What is it composed of?

Terebinthina Canadensis. What is it and what is it composed of?

What are the preparations? What are the doses? What are the action and uses of terebinthina?

Terpini Hydras. What is its source? What is its composition? Properties? Dose? What are its action and uses?

Thyroid Glands. What are the preparations? Their doses? What are the therapeutic applications?

Valerian. What is valerian? What substances does it contain?

What are its preparations? What are their doses?

What valerianates are official? What are their doses?

What are the action and uses of valerian?

Veratrum. What is veratrina? What is veratrum viride? What is the active principle of the latter substance? What is its nature?

What are the preparations of veratrum viride? What are their doses?

What are the preparations of veratrine?

What are the action and therapeutic indications of these drugs?

Viburnum Prunifolium. What is it and what is its active principle? What preparations are there? What is its dose?

Viburnum Opulis. What is it and what active principle does it contain?

What preparation is official? What is its dose?

What are the action and therapeutic indications of viburnum prunifolium and viburnum opulis?

Zincum. What are the official salts of zinc? What are their doses?

How do these salts differ in their action? What are the therapeutic indications of each?

Zingiber. What is it? What preparations are official? What are their doses? What are their action and therapeutic indications?

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